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The Cope & Maxwell Steam Pumping Machinery.

It is one of the characteristics of the age, that its real wants and demands in any direction are sufficient to develop the means for their supply; particularly is this the case in industrial operations. No sooner does it appear that the demand for a given production has outgrown the supply which had previously been sufficient, than a thousand busy brains become actively engaged in the problem of increasing the supply, or substituting an improved article.

Out of this great activity are gradually developed processes and devices, which shape themselves to best accommodate existing conditions and more fully satisfy the increased demand.

In no direction has this activity been greater, than in that of furnishing a more abundant supply of water for the various industrial operations and domestic uses of the country.

The continued introduction of steam and steam apparatus, in almost endless variety, and for almost every conceivable purpose, involves a very largely increased consumption of water, and the supply required in all manufacturing establishments as a protection against fire, and for use in very many of their processes, in hotels, and in the numerous public and private institutions and buildings, for domestic uses, has increased so largely, that the pumping facilities once sufficient for raising and forcing the necessary quantities to the parts desired, have become totally inadequate, and the demand for greater and improved ones imperative, and from this demand has arisen the Direct Acting Steam Pump, several varieties of which have appeared as claimants for public favor.

The accompanying engravings represent machines of this class, made by the Cope & Maxwell Mfg. Co., manufacturers of every variety of steam pumping machinery, Cincinnati, O.

They base their claims for superior merit and favor on the extreme simplicity of construction, the convenient arrangement of parts, and the great efficiency of their machines. As will be seen from the engraving, they have no complicated valve gearing, or external appliances of any kind. The horizontal machine is a direct and double acting steam lift and force-pump. It can be adapted to every variety of pumping service, feeding steam boilers and trucks, supplying rail road water-stations, rolling mills, iron-furnaces, breweries, distilleries, for draining mines, ditches, excavations, coffer dams, for water works, fire engines, sewers, &c., &c.

The steam and pump cylinders are closely connected being about half the length of the stroke apart. The steam and pump pistons are attached to opposite ends of the same piston rod, which, as it plies back and forth between the two cylinders, is the only moving piece to be seen. Its great simplicity becomes further apparent when it is understood that there are but two moving parts in the entire motor portion of the machine, the steam piston and steam valve.

The steam piston is longer than its stroke, is hollow and bored out true, the cylindrical cavity forming the steam chest in which the steam valve works like a piston, being operated by the steam acting directly on it, admitted through channels and parts in the piston and near the end of the steam cylinder.

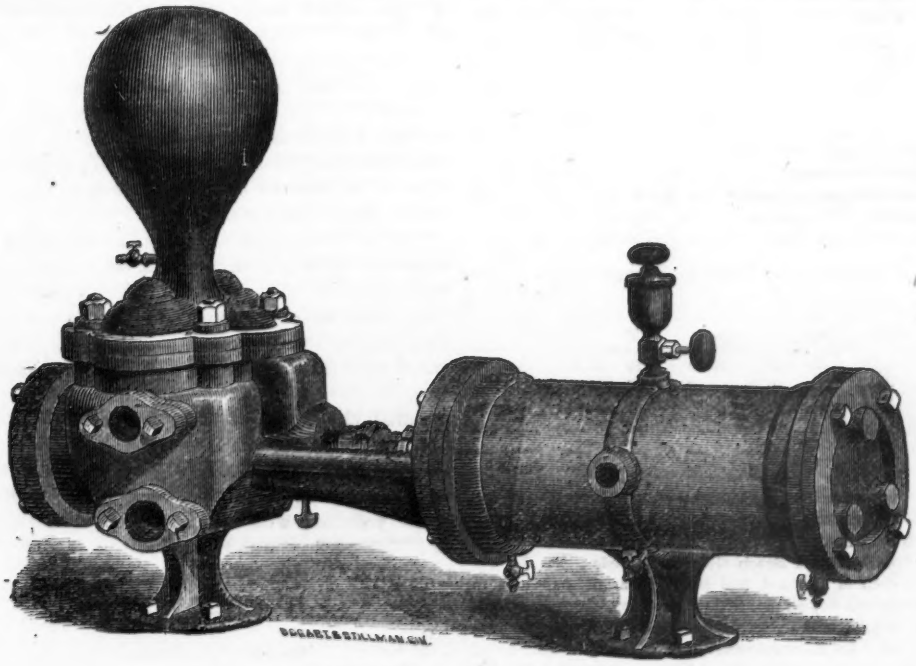
There are no centres or dead points possible; the engine will start from any point at which it may have been stopped by simply turning on steam. It is noiseless in its working, having no tappets or valve gearing of any kind, has but few points requiring packing or oiling, requires only the minimum amount of attention, and is not liable to get out of order.

The upright machine is specially adapted to feeding steam boilers. It is a single-acting plunger force pump operated by a steam engine, the two combined, and, like the horizontal steam pump, forming but one machine.

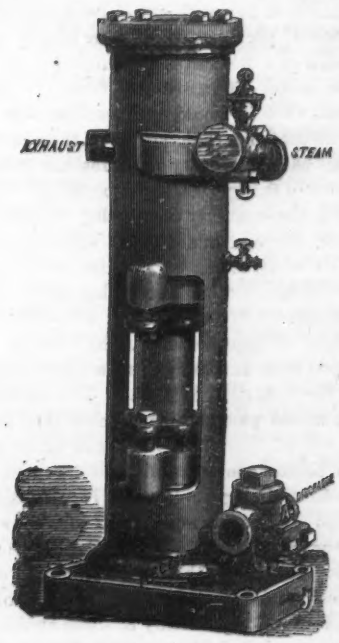
The steam and water cylinders are cast in one piece, forming the body of the machine, the portion above the open space in the centre being the steam cylinder and that below the pump cylinder. The steam piston is about twice the diameter of the pump-ram and the two are cast in one piece, the piston being hollow and the steam valve working inside of of it, the same as in the horizontal pump.

Steam is admitted to the two ends of the steam cylinder through separate throttle-valves, operated by the two wooden knobs or handles in front of the steam cylinder. The up-stroke, having only to raise the pump-ram, requires but little steam, whilst the down stroke, working against the boiler pressure, requires a full head. The different volumes of steam thus required by the two strokes are easily regulated by adjusting the two throttle-valves, so as to give to each its regular amount.

It sometimes happens that water is furnished to the pump in slow supply, and it is always desirable that the plunger should not ascend further than the water can follow, otherwise the pump will be obliged to work on a partial vaccuum. By the separate throttle the up-stroke can be made as slow as desired without any danger of stopping on centre, since, like the horizontal machine, it has no dead points, and will always start from any point at which it may have been stopped by simply turning on steam.



HORIZONTAL STEAM PUMP.



BOILER FEEDER.

The pump valves are contained in the chamber bolted on the front of the water cylinder near the bottom of the machine. They are made of brass, answering for hot water as well as cold, and can be removed by unscrewing the cap with square head on top of the chamber, or the entire valve chamber may be removed by unscrewing the two bolts which hold it to the body of the machine, without disturbing any other part or joint.

Simplicity of construction, convenience of arrangement and efficient operation has been the great aim and study throughout in getting up these machines, and their full success in this is shown by the great popularity they have obtained. They are in use, and giving the best of satisfaction, in every State of the Union. They have been patented in six European countries, and a house is established in London for their manufacture on a large scale.

The Cope & Maxwell Mfg. Co., 118, 120 and 122 East Second street, Cincinnati, O., are sole proprietors and manufacturers in this country. A splendid illustrated catalogue of steam pumping machinery will be mailed free to any address on application.

Blast Furnace Slags.*

[CONTINUED FROM PAGE 378.]

WE may then say with safety that a good white iron can be made with a slag containing 47 per cent. silica; this is as much as practice shows us, but the question arises, whether or not as good a white pig could not be made with a slag containing more silica. All of the slags given have more than enough base to saturate the silica and with few exceptions are about bi-basic silicates; that is, there are about two atoms of base to one of acid. Those slags which contain about 47 per cent. silica are sesqui-basic slags, i. e.: three of base to two of silica; those containing about 39 per cent. are bi-basic and those with more than 47 per cent. silica more nearly approach the formula of a neutral slag, which has one of base to one of acid. It is evident, from the preceding statement, that it would require less limestone to make a neutral slag than either of the others. Besides this as the quantity of limestone is decreased the amount of foreign matter to be melted is diminished, and the fusibility of the slag increased. Experiments, alone, can show the effect produced on the quality of the iron, by working for a white iron with the formation of a neutral slag and a low pressure of blast. The probabilities are, however, that with a slag of that fusibility, the furnace working rapidly and blast at a low pressure there would be no time for the reduction of silica. The loss of iron in this case would probably be greater than when the furnace worked more slowly: that is, there would be a greater percentage in the slag: but a furnace working on a neutral slag would make 1780 lbs. slag to the ton of iron and would require 0.22 tons limestone to do it: running on a sesqui-basic slag it would produce 2234 lbs. slag to the ton of iron and take 0.66 tons limestone for the ton of pig. Now allowing the greatest waste of iron in any of these analyses for a neutral slag viz: 2.90 per cent. iron, we would have 52 lbs. iron lost with a neutral slag, to the ton of iron; and allowing 1.50 per cent. iron lost with a sesqui-basic slag we would have an actual loss of 34 lbs. iron to the ton of pig. It will be seen at a glance that the losses of iron and the quantity of limestone are not in proportion, so without taking into consideration the possible saving of fuel, the economy of the neutral slag is apparent; but, should the quantity of coal for each slag be in proportion to the number of pounds of slag made the saving would be much greater. The only question undecided is the effect upon the quality of the iron, but this will never be settled, until some iron master shall be found who will be willing to make the necessary experiments, and not be guided entirely by traditions. The risk to a furnace would be nothing, the slag would be too fusible to engorge the furnace, and the hearth would remain intact, since it is siliceous slags which corrode the furnace-lining. The charge might be changed gradually until the proper slag should be reached and meantime the slag and iron could be analysed from day to day; should the iron deteriorate, it would then be time enough to change the charge. At all events it would involve the risk of making thirty or forty tons of pig which *might* be inferior, but when we consider the economy, which might result from it, this is but a slight risk to incur for the prospect of such a gain.

We must also consider the yield of the furnace in deciding as to the economy of making white pig. The forty-five foot furnace averaged 198 tons pig per week making white iron; the sixty foot furnace averaged 199 tons per week making grey forge iron. This is not in proportion to the size of the furnaces; as the larger one cost more than the smaller one, there will be of course a larger sum to be charged to the ton of product as interest on capital invested. If anything, there are more men around the large furnace and, as they are paid by the day and not by the ton, there will be a larger sum to be charged for labor.

To resume, we find that in working for a grey forge iron, we use a greater quantity of coal and limestone, the furnace works slower, and does not produce as much iron, and what is produced contains a greater amount of silicon than white iron, and the following analysis will show that they contain more carbon and less iron than white pig,

Pig Irons from Boonton Furnace No. 1.

No.	Character.	No. of Slag.	Si.	S.	P.	Fe.	Mn.	C.
1.	White	—	1.82	0.43	0.96	94.50	—	—
2.	Mottled	—	1.53	0.21	0.82	95.48	—	—
3.	White	—	0.42	0.09	—	95.92	—	—
4.	White	19.	0.44	0.19	0 75	96.18	—	2.63
5.	Grey	7	2 99	0.02	0.42	93.19	—	—
6.	Mottled	17	1.34	—	—	—	—	—
7.	White	18	0.56	0.41	1.36	95.65	—	—

Ores Used—For Nos. 1 and 2, one-third each of Millen, Orchard and Mount Pleasant; No. 4, one-third each of Swede, Orchard and Mount Pleasant; No. 5, one-half Hackettstown hematite; No. 6, one-third each of Mount Pleasant and Millen, and one sixth each of Swede and Beach Glen; No. 7, one-quarter each of Orchard and Mount Pleasant, and one-sixth each of Swede, Beach Glen, and puddled cinder.

Pig Irons from Boonton Furnace No. 2.

No.	Character.	No of Slag.	Si.	S.	P.	Fe.	Mn.	C.
1.	Grey	—	2.10	none	0.59	94.44	—	—
2.	Grey	—	0.99	0.08	0.61	94.65	—	—
3.	Mottled	—	1.59	trace	0.52	94.65	—	—
4.	Mottled	2	1.57	—	—	—	—	—
5.	Grey Forge	3	2 50	—	—	—	—	—
6.	Grey	1	1.85	0.06	0.87	94.50	—	—

Ores Used.—For No. 1, one-sixth each of Swede, Crane and Beach Glen, and one-quarter each of Orchard and Mount Pleasant; No. 2, one-third each of Mount Pleasant and Orchard, and one-sixth each of Beach Glen and Swede; No. 3, one-quarter each of Orchard and Mount Pleasant, one-third of Beach Glen and one-sixth Swede; No. 4, one-quarter each of Mount Pleasant and Orchard, one-third Millen and one-sixth Beach Glen; No. 6, one-quarter each of Orchard and Mount Pleasant, one-sixth each of Swede, Millen and Beach Glen; No. 6, one-third each of Swede, Orchard and Mount Pleasant.

Various Pig Irons.

Where from.	Character.	Si.	S.	P.	Fe.	Mn.	C.
Reigelsville.	Grey.	3.48	0.37	0.22	93.88	—	2.45
Andover.	White.	0.29	0.34	0.86	96.39	—	2.22
Columbia.	Grey.	0.78	none	1.03	94.80	0.27	—
Columbia.	White.	0.24	0.08	1.53	95,71	0.21	—
Glendon.	Grey Forge.	1.09	0.09	0.70	94.10	0.25	3.74

It having been established, then, that white iron is made cheaper, contains less silicon and more iron, the question arises, why is grey iron made for mill purposes?

Since puddling is a process of purification, it would seem that the pig which contains fewest impurities would answer best for the purpose. It is universally conceded that a white iron is easier worked and more adapted for forge purposes than grey iron, by reason of the difference of state in which the carbon exists. In spite of this there seems to be a great prejudice in favor of grey forge iron. For instance, I have seen a grey iron containing 0.61 per cent. phosphorus piled up for market, while a mottled iron, containing but 0.52 per cent. phosphorus (Nos. 2 and 3 from Furnace No. 2), was carried to the mill, because, from a casual inspection, the grey forge appeared the best of the two, when in reality it was not. Because a pig does not break easily, it does not follow, that it is better than one which does, when one is grey and the other white. No matter how pure a white iron might be, it would break with much more ease than a grey iron, on account of its physical structure. And it does not follow that when an iron is white and breaks readily, that when puddled it will not make as strong a bar as that from grey forge. The tests and standards for a foundry iron seem to be applied to a forge iron, which is manifestly unjust. For a foundry pig, the structure is almost everything, since upon it more than upon its chemical composition (within certain limits) its strength depends. But for puddling, where the entire structure of the iron is changed, and its original form cannot affect the strength of the bar, no such requisite is necessary, and consequently when time, labor, fuel and limestone are expended in making a grey forge iron, it seems to be simply a waste of material. There is no reason why, if a grey forge and a white iron, each containing the same amount of injurious matter, are puddled, the white shall not make equally as good a bar as the grey iron; on the contrary, the probabilities are that the white iron would make the best bar of the two, for its conditions of melting are such that there would be much greater chance for the elimination of the substances. Some one may urge the objection to this, that in the analyses of pig iron the white irons contain more phosphorus than the grey. To this I would answer that they were made with different ores. Unfortunately I have no record of analyses of grey and white pig made from the same mixture of ores. It seems to me sufficiently evident, nevertheless, that if the same ores are used and in one case a white and in another a grey pig is made, that there will be the same amount of phosphorus in each; or, if there is a difference, it will be in proportion to the carbon absorbed.

The difference between the percentages of iron in white and grey pig ought to make a difference in their value when used in a mill. To illustrate it, take an average of the percentage of iron in grey and white pig, and we have for the grey 94.18 per cent., and for the white 95.55 per cent., which is the same as a gain of 1.37 tons metallic iron in buying one hundred (100) tons of white instead of grey forge iron. In puddling this is not wasted, of course, and so, for a mill using 300 tons per week, there would be a gain of 4.1 tons iron per week, which is 200 tons in the year; and with iron at $30 per ton, amounts to $6,000 worth of iron in a year.

[TO BE CONTINUED.]

The Brown Hematite Ore Deposits of the South Mountains, Between Carlisle and Waynesbro' and the Southeastern Edge of Cumberland Valley.*

The observations here following are the result of an examination made as to the feasibility of extending the South Mountain Railroad from Pine Grove to Waynesborough, and of the commercial value of the ore through which such extension would be made to pass.

The road at present built and in operation has a junction with the Cumberland Valley Railroad, half a mile east of Carlisle, and extends southward to Pine Grove, a distance of 17½ miles. The extension proposed will add to it near 27 miles, making its total length 44½, more than 23 of which will run through or in close proximity to beds of ore.

Along the route taken there are a number of open

*BY KENNETH ROBERTSON, E. M., CHEMIST TO THE BOONTON IRON WORKS, N. J. A paper read before the American Inst. of Mining Engineers.

* A paper presented to the American Institute of Mining Engineers, at the Troy meeting, by J. H. HARDEN, M. E.

ings at which the ore is gotten, of which the Craighead bank, Huntzinger's bank, Lowrey's bank, Wenkoop's bank, the Henry Clay bank, the Fuller bank, and the Laurel bank, between Carlisle and Pine Grove, are examples. These openings produce on an average, each, about 50 tons of ore per day. Some of this produce is smelted at the two furnaces, Whitestown and Pine Grove; the Whitestown cold-blast producing 30 tons of iron per week, and the Pine Grove, hot-blast, producing 60 tons per week. Both are near their respective diggings; the remainder of the ore is exported. The Laurel forge, too, turning out 30 tons of blooms per week, stands on this end of the route.

The ore deposit here alluded to lies along the slopes and valleys formed by the spurs and separated ridges of the South Mountain, as well as of the southeastern edge of the Cumberland Valley, and in association with the clays and sands to which it once held a much nearer relationship, is the residue of decomposition in the dissolution of the slates and limestones at one time helping to make up the mountain. It is found all along the outlying edges, on the flat slopes, and in the cavities and caves of the underground convexities and peaks of the still existent, but slowly changing rocks. In the gorges and narrow valleys, extending a considerable distance from the foot of the mountain, linking as we cross the valley with other brown hemalite deposits, is the result of dissolution of higher beds of the great limestone formation, the whole belonging to the great Silurian system of Sir RODERICK MURCHISON—of whose death, while penning these lines, we read.†

The ore, though exposed to the surface in many places, has generally a red gravelly covering, varying in thickness from five to twenty feet, evidently a surface wash of subsequent date, local, and always to be distinguished from the one underneath.

The excavation from which Pine Grove furnace is supplied is 300 feet long, further extended by ore uncovered but not gotten, and 150 feet wide. Its depth, as now seen, averages 50 feet, including 15 feet of the gravelly wash above spoken of. Starting at the end and following it round to a close, there is exhibited a working face 900 feet long by 30 to 35 feet deep, or say 30,000 superficial feet of surface from which ore is being gotten, and from which, by the use of gunpowder, 50 tons have been brought down at a time.

In this face we have conditions of ore varying from a soft, greasy, ferruginous, maroon colored mud, impalpable, but highly charged, and, properly mixed for the purpose, would make good paint, to the hardest of hematite ore in rock, projecting from the face. The intermediates being made up of balls, shells, shards, flat pieces and amorphous masses, the whole grouted in with clays and red earth, streaked and marbled in colors varying from white to that of the darkest maroon, and in which every stage of the process of decomposition and reconstruction is to be seen, from the disintegration first begun to the completely crystallized hydrated peroxide of iron we are now discussing.

Allowing liberally for the imbeddings, the mass will consist of upwards of 75 per cent. of ore; and, charged with the oxides of a higher surface, oxides of ages of production, slowly concentrating, sliding and descending, as their density increases and as the shrinkage *en masse* of the disintegrating slates and dissolving limestones permit, the ore increases both in quantity and quality as the diggings deepen. The average metallic value of that now being gotten is 42 per cent. at the furnace.

But the floor of this excavation is still on the best and hardest of ore, and a bore-hole put down two years ago, 107 feet, was yet in it. The bit of the boring tool broke, and now remains in the hole. The depth of the ore, then, is not proven.

As well as northeast of these diggings, the South Mountain Iron Company have a continuation of this ore spreading over the slope of the mountain, and in the valley of Mountain Creek to the southwest, extending some three miles, and from a quarter to three quarters of a mile wide, into which shafts and drifts have been put with varying results, proving the extent and quality of the ore, and that, where the bottom of the deposit is yet unreached in diggings now at work, the densest ore has yet to be gotten.

Continuing the same course, and over Grave Ridge, after a pause of three and a half miles, at Wolf's Hill, at the head of Birch Run, and again on the Hosack Run, tributaries to the Conecacheague we are again on the same character of ore on property belonging to the executors of the late Hon. Thadeus Stephens, and from whence it was waggoned to the Caledonia furnace when it was in blast.

Jumping an interval, and in a recess of the slope of Chestnut Ridge, at a point parallel with the Chambersburg and Baltimore turnpike, we find ore in which there has once been a digging. It was abandoned, I am told, owing to occasional inundations from the creek.

Crossing the turnpike, and at the east flank of the Big Mountain, along it and between it and the Little Mountain, we are again on the ore. The synclinal conformation between the two mountains, holding that resulting from the dissolution of nobody knows how much of the rocks down to their present honeycombed and dissolving outcroppings and undercropping edges.

In front of the Little Mountain the ore is continuous, and has upon it the Caledonia bank belonging to the Stephens estate, and on its flank the Pond banks belonging to Mont Alto estate.

Nor do we lose sight of it again through the whole length of the route of the proposed extension to Waynesborough.

Two beds of magnetic ore also are to be seen in the Gneiss of the mountain, both on the Stephens and the Mont Alto estates, and limestone of better or worse effluxing properties is found along the whole distance, some of it containing from five to ten per cent. of iron. Boulders of it are also dug from the ore banks.

Five miles east of the latter place, in a gorge of the mountain, whence flow the head waters of the Antietam Creek, stands the Mont Alto Furnace and works. It is supplied with ore from diggings almost close at hand, and others within half a mile on the slope of the Big Mountain, and in immediate contact with the Potsdam sandstone. Though of a similar character, generally, to that described, the ore at these home diggings is not in so large lumps, and in consequence of its local position has more friable, less adhesive inbeddings, and is tolerably easily worked with the pick and shovel.

An analysis by Prof. Booth gave as follows:

Sesquioxide of iron	75.00
Alumina	1.00
Silica	16.00
Water	8.00

with a trace of lime remaining.

But as at Pine Grove, the denser and richer ore lies below the level of the present diggings, and at the Pond banks belonging to this property, a mile to the west, off the slope, and in front of the Big Mountain, the ore is good within five feet of the surface, and where shafts have been sunk the ore was found to be harder and more pure as the depth increased.

It was at the Pond banks of this property that in 1864, a mass of lignite was penetrated in sinking a shaft, and it is to a paper on the subject, read at one of the American Philosophical Societies meetings by Professor Lesley, that I am indebted for the following description of them, then not working, owing to water, and their distance from the furnace, having been discontinued some time before I made my examination of the neighborhood.

[TO BE CONCLUDED.]

† This is literally true; while my pen was on the line in which the name of Sir RODERICK MURCHISON occurs, the *Philadelphia Ledger* was placed before me, and the first paragraph I read was the announcement of his death.

Polytechnic Association of the American Institute.

Meeting held at the rooms of the Association in the Cooper Institute, December 8th, 1871, President S. D. TILLMAN in the chair.

The chief feature of this meeting was the reading by Mr. PARTRIDGE of a paper on "Boiler Explosions" by Judge A. L. HAYES, of Lancaster, Pa. The paper was a long one, the manuscript copy comprising nearly forty foolscap pages. We can only give an abstract, conveying, we think, a fair general impression of the argument. The author commenced by reviewing at length the history of several fearful boiler explosions, by which he attempted to prove that if water is heated above 212° under pressure a portion of it will not be, as has been asserted, quickly transformed into steam when the pressure is removed, and so exert an undue strain upon the boiler; and, secondly, that in the cases cited, the cause of the explosions could not possibly have been a gradually accumulated pressure of steam. He said the supposition that the water would flash into steam on the removal of the pressure is the same as supposing that the water explodes, which, he said, is absurd. In proof of this an instance is cited of the explosion of a boiler in which rags were treated under a pressure of steam, no water being present in the boiler. He did not wish to be understood as saying that boilers were never "split" by a pressure of steam, but he thought that in such cases no very disastrous consequences would be likely to follow; the boiler would open, the steam would escape, and that would be all.

An explosion which occurred at Lancaster, Pa., in the summer of 1867, showed, by the fearful devastation which it wrought, that it could not have been caused by an over-pressure of steam, and the fact that a second boiler, which was under the same pressure, did not explode, strengthened his proof. "There is nothing to warrant the supposition that the pressure was not the same in both boilers, and that one was not as strong as the other."

"When a breach in a boiler occurs at one extremity, the issue of steam through the breach diminishes the pressure upon the other extremity, as on the rest of the boiler, the pressure being an impelling force acting against opposite points in all parts of the boiler, all these points react by resistance, and whatever diminishes the impelling force at any point necessarily weakens it in every other; and the effect of the pressure breaking through a boiler at one end could never be to drive the other end in the opposite direction. The tendency would be, by lessening the impelling force there to give the reactionary or resisting power a movement in the same direction, with the steam issuing through the breach. But in the case we have detailed, the walls opposite to each end of the boiler were prostrated, and while the greater portion of the boiler, weighing three tons, was carried seven hundred feet north, the other end, a smaller portion, weighing about three hundred pounds, was sent through the south wall, forty feet from its position."

The PRESIDENT—It has formerly been asserted that water in the boiler is decomposed by heat. This cannot be true, because it requires, to decompose water, a higher degree of heat than is found in the boiler.

Mr. BLANCHARD—One point much dwelt upon in discussing the cause of the explosion of steam boilers, is the terrific force and suddenness with which they are exploded. And it is often said that if it were simply from a gradually increasing pressure, a boiler would give way at the weakest point. It is only good boilers which explode with such destructive force, and they have no weak point. The gentleman argues that if the boiler gave way from mere pressure within it, the whole boiler would go in one direction. An apparatus could easily be constructed to test this; and I think it would be found that the two ends would fly in opposite directions, as they do in boiler explosions. I have no method to propose to prevent boilers from exploding. It may be that we are making money by keeping at the very borders of

danger. We can secure perfect immunity from danger if we choose. We can make the shell so thick that it cannot give way; but we do not consider it expedient to do so. If we kept entirely clear from the borders of danger, we should never know where we were. We need something occasionally to warn us of the profitable line to pursue.

Mr. Hudson stated that while filling a soda fountain, it had exploded, the two pieces flying in opposite directions, although it was evident that the cause was over-pressure and not electricity.

Mr. Norman Wiard—It is unnecessary to inquire where the extraordinary force comes from, for in an ordinary boiler there is force enough stored up to raise 350,000 lbs. 750 feet high, which is a larger amount than has ever manifested itself in an explosion. There were some experiments at Castle Garden a few years ago, in which electricity was derived from a boiler; but the boiler was insulated; and a spark could not be obtained from a boiler which was not. I do not therefore think it necessary to discuss the question of electricity. But I wish to say that Mr. Blanchard is mistaken in supposing that boilers can be made strong enough by using thicker iron. A shell an inch in thickness would not be so strong as a shell of one-fourth that thickness; for the reason that the unequal expansion of such thick plates would cause a rupture in a short time.

Dr. L. Bradley.—I cannot assent to the proposition, in this paper, that thunder is due to the explosion of gases that have been decomposed by electricity, the quantity of gas evolved is so small compared with the atmosphere around it, and it requires so small an admixture of common air to make the gases non-explosive.

The President—There may be an explosion without any increase of volume. For instance, mix hydrogen and chlorine in the dark. Expose them to light, and they will combine chemically with an explosion, although the volume is unchanged. Choosing partners for a dance causes a considerable stir in a ball room, although the persons present take up no more room than before. A chemical selection of partners, by particles of matter, may be sudden and violent.

Mr. F. A. Woodson—It is always improper to look for the cause of a phenomenon at a distance, when there is adequate cause close at hand. In the relations of steam, water, metal, and fire, we have adequate cause for the most violent explosions. I hold that the great Creator has given to man to control the elements, and that we may bring steam under absolute control. Mr. C. Wye Williams has illustrated the behavior of water in a boiler, and shown that when separate channels are not afforded for the ascending and descending currents, there is violent intermittent action. Steam does not conduct heat; and there is a film of steam formed between the iron and the water, first exceedingly thin, but which may become two inches thick. When this is broken through by the intermittent action, there is a tremendous force. Water, though fluid, is adequate, when thrown in bulk, to break any piece of iron that can be constructed. I have known one boiler out of fourteen, to explode at a pressure of 45 lbs. The boiler had borne 70 lbs. for a year, but had a defective sheet, and the differential expansion had weakened it until it gave way. It is remarkable, if electricity is the cause of explosions, that it should always find the weakest boilers, and the weakest places in the boilers.

Mr. Wiard—It is utterly impossible that there should be a film of steam formed between the water and the iron. You can make a plate of iron so hot that when you throw water upon it there will be no contact, the water taking the spheroidal condition; but you cannot heat the iron while water is in contact with it, so as to drive the water away.

Mr. Woodson cited instances where he believed such a film had been formed.

The President—The writer of this paper says he does not believe that water will flash into steam. It is an established fact that if the pressure is high enough to prevent steam from forming, when the temperature is above 212°, on removing the pressure, steam is instantly formed, sufficient to take up all the surplus of heat.

Mr. W. E. Partridge—It may be interesting to state the figures. If we reduce the pressure instantaneously in a boiler from 25 lbs. to the square inch to 15 lbs., 21 per cent. of the water in the boiler will be changed into steam at the reduced pressure; and this will increase the bulk of the whole of the water 16 times.

Mr. Wiard—And no matter whether it is done suddenly or slowly.

The President—One point of this paper is that electricity fills the celestial spaces instead of ether. Electricity is not a fluid. It is a force, manifested both through the ether and through solid, ponderable matter. It is difficult for statical electricity to leap through ether. Another point is the formation of clouds. He asks why the clouds float. The vapor of steam has only one-half the weight of air. A certain amount of vapor is taken up, and remains suspended in the air, without increasing its bulk; and when the air is saturated, the excess drops out in the form of rain.

The further consideration of the subject was postponed until the next meeting.

The Woodson Steam Boiler.

Mr. F. A. Woodson exhibited a model of his improved steam boiler, and explained its operation in separating the ascending from the descending current, so as to prevent intermittent action, and equalize the temperature of the boiler. Adjourned.

The American Institute of Mining Engineers.

Report and Suggestions by Martin Coryell, Secretary, Presented at the Troy Meeting.

The names of members enrolled on the secretary's book, previous to the Troy meeting, number one hundred and fifteen; and fifty-five members have paid their initiation fee, and there has been paid for printing, books, advertising and postage $113 25, leaving a balance in the treasury of $436 75, as per treasurer's statement. I have to record the death of a member, Col. Washington Lee, Sr., in the 84th year of his age. With an intellect and memory clear and active, he took great interest in the formation of our Institute.

Col. Lee secured at an early day one of the finest and most romantic locations in the Wyoming Valley, was one of the early, active and persevering pioneers in the coal trade, suffered from the want of transportation and pecuniary difficulties, but by integrity and sound judgment overcame all difficulties, and finally left an estate of some $1,250,000.

At the late meeting at Bethlehem, there was unfortunately an irregularity and carelessness in the business transactions of the society, in result of which, it is feared that the names of some persons elected as members or associates do not appear on the record. The secretary begs the assistance of members and associates in the correction of the lists.

Members are urged to hand in their papers properly endorsed with name of subject and the name and address of the author and the presentor; and to present all resolutions in written forms, with the mover's name attached.

The name of our society and the classification of members does not seem to meet the requirements of the day; and some change in these respects should be made at the next annual meeting.

The proceedings of our meetings and of the excursions connected therewith, and copious extracts from some of the papers read at the meetings, have been selected and published in the Engineering and Mining Journal; yet this does not prove so satisfactory to the members in general as would a regular journal of the society.

The constitution and bye-laws and the order of business should be published in a more convenient form, and distributed to the members and officers, and some provisions should be made for transcribing the papers read into a book, properly paged and indexed. This, with the duties of notifying members of meetings, and of collecting dues, imposes a labor that must be provided for in the future, to make our society a success.

The President of the Lehigh University, Dr. Henry Coppée, has tendered to the "American Institute of Mining Engineers" a permanent place for their meetings in Packer Hall, and a room for their collections and archives, and the use of one of the large halls when required. No action has been taken on this liberal offer further than to acknowledge the receipt and to thank Dr. Coppée.

Subordinate societies should be formed under the direction and guidance of the parent society, by which the local members may assemble together and contribute to the general knowledge and information by well-digested reports and essays on the particular subjects which occupy their attention.

The interest manifested in the establishment of this society is decisive and expressive, and the advantages and pleasures of acquiring information and of social intercourse have been effectually realized by a large number of the members. With proper exertion, and a reasonable devotion of time by each individual member to the general welfare, our society will grow in numbers and strength, will spread information and enjoyment, and be a source of pride and usefulness to our country.

Wilkes Barre, Nov. 20th, 1871.

German Correspondence.

B.—Saxony, Oct. 29, 1871.

To the Editor: You know it is only a short time since I arrived here from the United States, and as you are well aware how difficult it is in your country for a mining engineer to secure a position adequate to his attainments, you will probably be astonished if I tell you that I have already received an appointment, that as Superintendent of a new coal mining enterprise. But still more you will be astonished when you hear with what remarkable energy industrial enterprises are pushed forward of late in this neighborhood, and, in fact, throughout Germany. New companies are continually formed, old ones, the operations of which had come to a stop, are revived; industry is taking such rapid strides forward, that the coal produced from the Zwickau and Lugau mines is insufficient to supply the demand. Coal prices are twice as high as they were only a few years ago, and yet it is considered an act of kindness and obligation, if a mine manages to let irregular customers have a little coal once and awhile. The consequence of this is, that even mines, which formerly were abandoned as not paying, are now taken up again with a will, as for instance, the Westphalia, near Lugau. The stocks of the new enterprises are already sold at 100 per cent. premium, and often at higher prices, though the coal lies in all cases very deep—the bed I am to work, lying 1,800 feet below the surface. The stocks of some of the works, which have produced for some time, are in the market at prices ranging from 10 to 100 times the par value.

We are at present engaged in preparing for a great change in our system of weights and measures. The only recognized measures after the 1st of January will be the meter, the liter, and a pound, equal to five hundred grammes, and divided decimally. These changes I gladly welcome, and hope that the same system will be introduced throughout the world.

Our coinage will doubtless be changed also; but it is not yet fully determined whether the third of a thaler, with 100 pfennige, or the Austrian gulden, two-thirds of a thaler, with 100 kreutzers will be taken as a unit. Whichever is taken, it will be brought in unison with the English currency, by making it equal to either one or two shillings.

A. M.

Since the above was written the Mark, one-third of a thaler, or ten Prussian groschens has been adopted as a unit for the new system of coinage.—Ed.

THE COAL TRADE.

B. B. WESTERN, COAL EDITOR.

Anthracite Coals.

WHOLESALE.—The demand for every kind of coal is very light. This arises from the desire of dealers to close their accounts for the year, and the general unsettled state of all branches of business, and also from the stringency of the money market. Some dealers have been caught with large stocks on hand, on which they must make heavy losses to compete with their neighbors who have been more lucky, and purchased of late at reduced rates. Everybody is looking forward to the result of the next Scranton sale, and much anxiety is expressed regarding a further decline.

It is our opinion that there will not be any notable reduction in prices at this sale.

What coal is being sold brings circular prices, but the amount of traffic is so small that it can hardly be quoted as any standard to be governed by.

The difficulty we noted last week in regard to the chartering of vessels for this point yet exists, even to a more alarming degree. Some parties state that it is impossible to get vessels even at any price, but of course it is understood that shippers are limited to a rate of from $3 to $3.25, which is quoted as the ruling freight to Boston, and which is from 25 to 50 cents higher than quoted last week.

In conversation with many prominent coal merchants in Trinity Building, relative to the prospects for the future, we find a general lack of interest as to what may turn up. All acknowledge that matters cannot get much worse, and any steps taken by either miner or operator must accrue to the advantage of the trade. The impression seems to be that Schuylkill County must stop, and that the low prices will make it impossible for many operators in the Lackawanna and Wyoming regions to keep going.

Our advices from the various coal regions are a little mixed; our correspondents agree, however, that the strike, if any, will not take place till late in the spring. Their reason for this is that the miners are yet in a very impoverished condition from the last strike, enough time not having elapsed to allow them to pay off the indebtedness incurred then. Furthermore, we understand that there is much dissatisfaction with the Grand Moguls of the W. B. A. Most of the miners believe that the organization and its organ have led them into difficulties and brought upon them troubles that otherwise would not have occurred, and that they have reared an antagonism between them and their employers without accomplishing any good result. They, therefore, propose to cut adrift from it, and hereafter, as heretofore, shift for themselves.

Be this as it may, as yet we hear of no action being taken relative to a suspension, and we believe that as "half a loaf is better than no bread," the miners will favor the operators and continue work as long as they will allow them.

There is no doubt that the miner gets paid more liberally than any other workman, even taking into consideration the extra hazardous nature of his work. They can submit to a considerable reduction in their wages if they choose, and if they will do so, and thus permit the community to have coal cheaply, they will greatly increase the consumption and keep themselves in work. If, on the other hand, they insist on high wages, which in turn must make high prices, and high prices necessarily contract the consumption, a surplus will accumulate; a strike or stoppage must take place to curtail the supply, and the miner will work only half the year.

We should like to see the low price system tried: we would like to know how much the consumption could be increased by low prices, and what is the lowest wages that a miner can live on in as good style as other practical laboring men. This fact has never been demonstrated as yet, and the frequent strikes have prevented the solution of the problem.

The Philadelphia and Reading Rail Road, closed their fiscal year on Nov. 30, 1871.

Total amount carried in 1871, including coal for Company use.

		6,002.573.
do	do.....1870,	4,623,504
	Increase,.....	1,369,068.

The Lehigh Valley Rail Road closed their fiscal year Nov, 30, 1871.

By Rail and Canal, 1871,	3,244,170.
" " 1870,	3,622,433
Decrease,.....	378,263

The amount of coal transported by the Schuylkill Canal was, for the year ending Nov. 30, 1871, 1,010,170.

do	do.....1870,	560,665
	Increase,.....	449,505.

BITUMINOUS COAL.—The demand for Bituminous Coals, particularly those of the Consolidation Coal Company, is in excess of the supply. This is a curious fact compared with the decline in Anthracite coals. The fact of the matter is that the hold that the soft coals got upon our large manufacturers and steam-ship companies, during the great strike in 1870, is in consequence of their superior steam generating properties, not easily shaken off. The Anthracite fields claim to have missed the sale of 1,500,000 by this means during the past year, and if the Bituminous Coals continue to be furnished as promptly and regularly next year as this, there is no reason why twice the quantity should not be sold.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Dec. 9, 1871, compared with the week ending Dec. 10, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R†	....	2,984,263	....	3,659,436
*Schuylkill Canal	....	560,665	....	1,010,171
*Lehigh Valley R. R.	....	2,810,020	....	2,210,272
Lehigh & Sus. R. R.	33,395	998,717	34,809	1,233,085
Lehigh Canal	....	781,239	....	740,636
Scranton North	1,566	665,850	8,872	525,394
" South	2,957	1,676,558	48,825	1,295,600
Penn. Coal Co., rail	3,523	1,067,613	16,301	736,300
" " canal	....	16,603	....	13,962
Del. & Hud. Canal Co.	....	1,292,675	....	991,825
" " East	8,077	431,490	9,879	327,292
" " West	329	82,808	2,652	111,986
South	1,950	415,647	9,889	319,359
Shamokin	8,058	464,433	7,912	605,056
Trevorton	....	67,371	....	....
Lykens Valley Coal Co.	....	67,774	1,983	91,074
Wyoming South	....	326,645	....	....
Wyoming North	....	....	....	4,167
P. N. Y. C. & R. R. Co.	....	276,151	....	104,987
Williamstown Col'y	5,259	286,560	....	....
Big Lick Col	304	88,890	3,155	142,485
Total	61,418	15,361,972	144,277	14,043,087
1870		14,043,087	65,418	
Decrease		1,318,885		
Increase			78,859	

* These figures are for the week and fiscal period ending Nov. 30. See tables below for tonnage since Dec. 1.

† Less coal transported for Co's use and Bituminous coal.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coa passing over the following routes of Transportation for the week ending Dec. 9, 1871, compared with week ending Dec. 10, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
C. & O. Canal	1,423	519,542	872	653,420
B. & O. R. R.	26,578	841,534	24,832	1,168,822
H. & B. T. R. R.	6,909	294,384	4,853	308,843
*Harrisburg & D.	....	680,791	....	742,424
*L. V. R. R.	....	13,847	....	355,096
P. & N.Y.C. & R. Co.	....	239,660	....	....
Cumberl'd Branch Canal	213	84 238	35	194,029
" Railroad	980	112,170	3,387	68,956
Total	36,102	2,786,166	33,979	3,486,590
	33,979			2,786,166
Decrease	2,123			
Increase				700,424

The tonnage of the P. & N. Y. C. & R. R. Co. is included in that of the L. V. R.R. Co

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Sus. Div.)

Week ending Dec. 9—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1871., tons ct	WEEK 1870. tons ct.	YEAR 1871 tons cwt.	YEAR 1870, tons. cwt.
Wyoming Region	28068 10	22867 08	1235063 18	1188534 06
Upper Lehigh Region	4196 16	3821 03	101419 08	146387 13
Beaver Meadow Region				
Hazleton Region	194 17	3382 05	212382 01	317681 08
Mahanoy Region				
Trescow Region	1692 15		76972 16	
Mauch Chunk Region	6200 07	9564 08	221426 04	127422 05
Totals	40352 16	39635 04	1847264 07	1780025 04
Increase	717 12		67238 13	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	34809 03	38394 15	1233065 00	998716 17
Forwarded East of Mch Chunk by Canal	333 10	4191 08	420149 06	528297 15
Delivered at and above Mauch Chunk	1801 15	1590 15	65612 05	44488 10
Delivered to L. & B. R. R. at Plymouth Bridge	3142 14		99975 15	184261 12
L. V. R. R. at Packer'n	265 14	458 06	28412 01	24261 00
Totals	40352 16	39635 04	1847264 07	1780025 14
Of the above there was transported on acc'n of L. C. & I. Co.	8156 01	12386 02	328112 08	177920 12
W.-B. C. & I. Co.	20342 01	17597 17	823548 05	599327 06
Totals	28498 02	29983 19	1151660 13	777247 18
Increase	1485 17		374413 15	
Decrease				

Lehigh Coal and Navigation Company.

Report of Coal transported over the Lehigh Canal and L. & S. Div. of Central Railroad of New Jersey for the week ending Dec. 9, 1871, and for the year 1871.

	WEEK.	YEAR.
Forwarded East of Mauch Chunk by Rail	34,809	1,233,085
Delivered at and above do.,	1,801	65,642
Forwarded East of do., by Canal	....	740,636
	36,610	2,039,363
Corresponding period last year—		
Forwarded East of Mauch Chunk by Rail	33,394	993,716
Delivered at and above do.,	1,590	44,483
Forwarded East of do., by Canal	7,085	788,377
	42,070	1,831,583
Increase on Railroad	1,625	255,521
Decrease " "		
Increase on Canal		
Decrease " "	....	47,741
Of the above there was transported on account of—		
Lehigh Coal Nav. Co.	8,156	590,891
Wilkesbarre Coal & Iron Co	20,342	823,548
	28,498	1,414,439
Corresponding period last year—		
Lehigh Coal Nav. Co	13,652	288,590
Wilkesbarre Coal & Iron Co	17,597	599,327
	31,250	887,917
Increase		526,522
Decrease	2,752	

Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railroad during the week ending Saturday, Dec. 9, 1871:

	tons. cwt.
From St. Clair	36 617 14
" Port Carbon	5,875 16
" Pottsville	785 08
" Schuylkill Haven	4,816 01
" Auburn	7,813 10
" Port Clinton	6,816 16
" Allentown and Alburtis	259 01
" Harrisburgh and Dauphin	14,114 09
Total paying freight	77,106 15
Coal for Company's use	3,763 07
Total for week	80,869 02
Previously this year	23,587 13
Total	104,456 15
To same time last year	70,991 06

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, Dec. 9, 1871.

	Tons. Cwt.
From Port Carbon	— —
" Pottsville	— —
" Schuylkill Haven	5,060 02
" Port Clinton	
Total for week	5,060 02
Previously this year	5,298 10
Total	10,378 12
To same time last year	25,331 00

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Dec. 9, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	16,301 11	736,300 04	3,523 05	1,067,613 00
" Canal	.....	13,962 04		16,602 18
Total	16,301 11	750,262 08	3,523 05	1,084,215 18
Decrease 1871,	333,953 11			

Delaware and Hudson Canal Company.

The following is a statement of Coal Transported by the Delaware and Hudson Canal Co. for the week ending Dec. 9, 1871.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	.....	991,825
By Railroad, East	9,879	327,292
" " West	2,652	111,986
" " South	2,889	319,359
Total Tons	22,420	1,750,462

For the same period last year.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	.....	1,292,675
By Railroad, East	8,077	431,490
" " West	329	82,808
" " South	1,950	415,647
Total Tons	10,356	2,222,620
Decrease	472,158	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Dec. 9, 1871.

	WEEK.	SEASON.
North	46,067 19	1,542,080 18
South	8,889 08	319,358 18
Total 1871	55,957 07	1,861,439 16
Corresponding time in 1870:		
North	1,646 14	1,930,747 11
South	1,950 06	415,646 18
Total	3,597 00	2,346,394 09
Increase North	44,421 05	
Decrease North		388,666 13
Increase South	7,939 02	
Decrease South		96,288 00
Total increase 1871	52,360 07	
Total increase 1871		484,954 13

Shamokin Coal Trade.

For week ending December 9, 1871	7,912.04
Same time last year	8,057 14
Increase	145 10
Decrease	
Total amount shipped to date	605,055 18
Same time last year	464,433 01
Increase	140,622 17
Decrease	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna and Western R. R. for week ending Dec. 11, 1871.

	Week. Tons. Cwt.	Year. Tons. Cwt.
Shipped North	8,872 06	525,393 14
Shipped South	48,825 07	1,215,599 15
Total	57,697 13	1,740,993 09
For the corresponding time last year:		
Shipped North	1,566 06	665,850 03
Shipped South	2,957 01	1,676,558 01
Total	4,523 07	2,342,408 04
Increase	53,174 06	
Decrease		601,414 15

Huntington and Broad Top R. R. Co.

For week ending Dec. 9, 1871	4,853 tons.
Same time last year	6,909 "
Increase	
Decrease	2,056 "
Total amount shipped to date	303,843 "
Same time last year	294,384 "
Increase	9,459 "
Decrease	

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, December 9, 1871.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons. Cwt.
From St. Clair	36,617 04
" Port Carbon	5,875 16
" Pottsville	785 08
" Schuylkill Haven	4,816 01
" Pine Grove	4,915 14
" Tamaqua	6,818 16
" Harrisburg	
" Dauphin	4,856 16
Total	64,685 15

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	2,588 12
" Mill Creek "	86 16
" Schuylkill Valley Scales	
" Mt. Carbon "	
" Cressona "	283 17
" Pine Grove "	
" Tamaqua "	166 01
Total	3,125 06

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	945 14
" Shamokin	4,151 07
" Herndon	
Total	5,097 01

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,368 15
" Lebanon & Pine Grove Branch	1,202 16
Total	2,571 11

CONSUMED ON LATERALS.

From Frackville Scales	849 17
" Mill Creek "	913 01
" Schuylkill Valley Scales	694 16
" Mt. Carbon "	628 00
" Cressona "	689 15
" Pine Grove "	314 14
" Tamaqua "	350 07
Total	4,410 10

LEHIGH AND WYOMING COAL.

Received via Allentown, E. Penn'a Br.	229 02
" " Alburtis, " "	29 19
" " Oreland, G. & N. Br.	1,018 03
" " Connecting R. R.	
" " Willow Street R. R.	62 08
Total	1,339 12

BITUMINOUS.

From Harrisburg	9,257 13
" Connecting R. R., G. & N. Br.	
" Junction R. R.	114 01
Total	9,371 14

COAL FOR COMPANY'S USE.

Anthracite	3,732 08
Bituminous	241 17
Total	3,974 05

RECAPITULATION

	Total for Week.	Cor. week last year.	Increase & Decrease.
Passing over Main Line and Leb. Val. Branch	64,685 15	55,860 09	i 8,825 06
For Shipment by Canal	3,125 09	10,699 14	d 7,574 08
Shipped Westward via Northern Central R. R.	5,097 01	7,009 10	d 1,912 09
Shipped West or South from Pine Grove	2,571 11	2,217 18	i 353 13
Consumed on Laterals	4,410 10	3,435 03	i 975 07
Lehigh and Wyoming Coal	1,339 12	1,270 14	
Total Anthracite paying fr'gt	81,229 15	80,493 08	i 736 07
Bituminous	9,371 14	10,306 13	d 934 19
			i 68 18
Total of all kinds paying fr'gt	90,601 09	90,800 01	d 198 12
Coal for Company's use	3,974 05	2,864 09	i 1,109 16
Total Tonnage for Week	94,575 14	93,664 10	i 911 04
Previously this year	30,347 08	46,439 02	d 16,091 14
Total to date	124,923 02	140,103 12	d 15,180 10
SHIPPED BY CANAL.			
From Schuylkill Haven	5,080 02	13,761 04	d 8,681 02
" Port Clinton		1,279 00	d 1,279 00
Total Tonnage per Week	10,378 12	15,040 04	d 9,660 02
Previously this year	5,299 10	14,400 05	9,101 15
Total to date	10,378 12	29,440 09	d 19,061 17

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Dec. 9, and during the year 1871, compared with the corresponding period of 1870.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B.&O.R.R. Co 'tons Cwt.	Total. Tons. Cwt.
1871	871 19	24,832 03	25,704 02
1870	1,422 13	26,578 01	28,000 14
Increase			
Decrease	550 14	1,745 18	2,296 12

YEAR.

1871	653,420 02	1,168,822 04	1,822,242 06
1870	519,542 10	841,533 12	1,361,076 02
Increase	133,877 12	327,288 12	461,166 04
Decrease			

Cumberland Branch

WEEK.

	To C.& O. Canal Tons. Cwt.	To B.&O. R.R. C. Tons. Cwt	Total. Tons Cwt.
1871	35 02	3,387 06	3,422 08
1870	212 01	980 01	1,192 02
Increase		2,407 05	2,230 06
Decrease	176 19		

YEAR.

1871	194,028 12	68,955 17	262,984 09
1870	84,238 05	112,170 08	196,408 13
Increase	109,790 07		66,575 16
Decrease		43,214 11	

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. Dec. 16. R. A.	W. A.	AT PHILADELPHIA. Dec. 16. R. A.	W. A.
SCHUYLKILL.				
Lump	$—	$—	— —	— —
Steamer	4 50	— —	— —	4 50
Broken	4 50	— —	— —	— —
Egg	— —	— —	5 00	— — 4 75
Stove	5 00	— —	5 00	— — 5 00
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 50	— —	— —	— —
Broken	5 50	— —	— —	— —
Egg	5 50	— —	— —	— —
Stove	6 00	— —	— —	— —
Chestnut	5 00	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A. 6 00@6 25		— —	— —
New England	"	—	— —	— —
Locust Mountain	W. A.	6 50	— —	— —
Honey Brook, Le'h	W. A.	5 00@6 00	— —	— —
Spring Mountain	"	5 00@6 00	— —	— —
Sugar Creek	"	5 00@6 00	— —	— —
Sugar Loaf	"	5 00@6 00	— —	— —
Old Comp'y's	"	5 00@6 00	— —	— —
Cross Creek	"	5 00@6 00	— —	— —
Room Run	"	5 00@6 00	— —	— —
Girardville	"	"	— —	— —
McMichael	"	"	— —	— —
Shamokin	"	"	5 25	— —
Lykens Valley	"	"	5 75	— —
Broad Top	"	"	5 25	— —
Hill & Harris	"	"	— —	— —
Henry Clay	"	"	— —	— —
Powelton	"		5 25	— —

*Dealers in these coals may be found in our advertising columns.

Company Coals.

Dec. 1871.

	L.	Str.	Gra.	Eg.	Sto	Chest
*Scranton at E. Port	— —	— —	— —	— —	— —	— —
*Pittston at Weehawken	4 60	4 60	4 80	4 90	5 20	4 60
*Lackawana at Weehawken	4 60	4 60	4 80	4 90	5 20	4 60
Wilk'b're, at Hoboken	4 00	4 00	4 50	4 60	5 50	5 40
Old Co. Lehigh at Pt John's	5 00	—	5 00	5 00	5 50	4 50
Lehigh at Eliz. Port	5 00	—	5 00	5 00	5 50	4 50

For freights to different points see "Freights."

* To contractors.

Line Prices for Coal Dec, 1871,

	Lump	Broken	Egg	Stove	Ches'
At Mauch Chunk	4.00	4.00	4 00	4.25	3.00
" Wilkesbarre	3 75	3.75	3.75	4.00	3.00

Prices at Baltimore—DEC., 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 60@5 85
Pittston and Plymouth, do	— —@5 60
Shamokin Red or White Ash, do	— —@5 60
Lykens Valley Red Ash, do	— —@6 30
Zerba Valley	— —@— —
Trevorton	— —@— —
By retail, all kinds per ton of 2240 lbs	7 00@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	— —@4 50
Fairmont and Clarksburg gas, f. o. b. at L. Point	6 00@6 50
BITUMINOUS COALS.	
Kittaning Coal Co.'s Phœnix Vein f. o. b. at Phila	$ —
Lemon " " "	—
Cumberland Vein Coal	—
Consolidation Coal Co.'s on board N. Y.	6 75
Maryland Coal Co. " "	6 75

Prices at Georget'n, D.C., & Alexandria, Va.

Dec, 1871.

George's Creek and Cumberland f. o. b. for shipping	$4 35@4 05

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$5 25@5 50
Lykens Valley	6 22½@6 50
Shamokin Red or White Ash	5 50@5 75
Trevorton and Zerba Valley	— —@— —

Prices of Gas Coals.

Dec, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y.
Duty, $1 25, gold

	Coarse	Slack.
Block House	$1 75	@-1 75
Gowrie	1 75	@-1 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal
Pictou	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 60	@- 80
Little Glace Bay	1 60	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	$7 00 @- —
Fairmount Gas Coal Co. of N. Y.	7 00 @- —
Despard Coal Co	7 00 @- —
Penn	7 00 @- —
Newburg Orrel Gas	— — @- —
West Fairmount Gas Coal	7 00 @- —

AT PHILADELPHIA.

Powelton	$6 75

TO NEW YORK.

Provincial.	
Sidney	$3 25
Lingan	3 25
Cow Bay	3 12½
Port Caledonia	3 37½
Little Glace Bay	3 25

Prices of Foreign Coals.

Dec, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, N. Y.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	10 50@12 00
" House "	— —@16 00
" Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
"Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered.

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven for consumption	$2 10
For reshipment	2 00

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 92
C. R. R., N. J., Phillipsburgh to Elizabethport	1 88
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$3 15

MAUCH CHUNK TO PORT JOHNSON.

L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 92
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 88
Shipping expenses	25
Wharfage	10
Total	$2 15

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Phillipsburgh	$ 92
Morris & Essex R. R. Phillipsburgh to Hoboken	1 88
Shipping expenses	20
Wharfage	16
Total	$2 15

TO SOUTH AMBOY.

L. V. R. R.	92
B. & D. R. R.	
Cam. & Am. R. R.	1 81
Shipping Expenses	35
Total	$2 08

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	90
C. RR. of N. J. Phillipsburgh to Elizabethport	126
Shipping expenses	25
Wharfage	10
Total	$ 2 51

Freights.—Dec. 1871,

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore.	Anthracite. From Philadel'a.	Anthracite. From East Port, Port Johnston, and Hoboken.	Anthracite. From Newburg.	Anthracite. From Rondout.
Amesbury			$2 50	$1 95		
Bangor	$2 75		2 25	2 00		
Bath	2 75	2 65	2 35	1		
Boston	2 60	2 60	2 25	3 00		
Bridgeport	2 25	2 30		1 10		
Bristol		2 60		1 50		
Cambridgeport			2 35	3 30		
Derby				1 25		
Dighton	2 30	2 35				
East Cambridge				3 20		
Fall River	2 25	2 30		1 50		
Hackensack				1 10		
Hartford	2 75	3 00	2 40	2 00		
Jersey City		2 00		55		
Middletown				1 25		
Mystic				1 30		
New Bedford	2 50	2 35	2 00	2 25		
Newburyport	2 75			3 00		
New Haven	2 25	2 30		1 10		
New London	2 25	2 30	1 95	1 35		
Newport				1 50		
New York	2 00	1 90	1 40	55		
Norwalk		2 30		1 10		
Norwich	2 25	2 30		1 45		
Pawtucket	2 50	2 50	2 15	1 80		
Portland	2 50	2 60	2 40	1 70		
Portsmouth, N. H	2 75	2 75		3 00		
Providence	2 25	2 30	2 00	1 50		
Rockport						
Saco	2 75		2 65			
Sag Harbor				1 20		
Salem	2 60	2 65	2 25	3 00		
Stamford				1 10		
Stonington				1 25		
Taunton				2 00		
Warren				1 00		
Washington			1 25			
TO RIVER PORTS.						
Albany						
Catskill						
Cocksackie						
Coeyman's						
Cold Spring						
Fishkill						
Haverstraw						
Hudson						
New York						
Nyack						
Poughkeepsie						
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy						
West Point						
Yonkers						

MARKET REVIEW.

FOR THE WEEK ENDING DEC. 16, 1871.

IRON.—The market for Scotch Pig continues light, but with a small stock and advancing foreign markets, prices are supported. We note a sale of 200 tons Glengarnock, on private terms. Glengarnock is held at $34, Eglinton $33.50@$34, and Summerlee $35@36. American remains without animation, and prices are not very strong; we quote nominally No. 1 $36@$37, and No. 2 $34@35. There has been very little inquiry for either new or old Rails, but prices are unchanged; we quote English $57 @$59 gold, and American $70@$71 currency, at the works in Pennsylvania. Refined Bar continues very firm but without further change in prices. Russia Sheet is quiet, and Black Sheets are scarce and firm.

LEAD—The demand for Pig has been almost entirely for small parcels to supply the wants of local Dealers. The closing of navigation interferes with out-of-town Trade, and what lots are wanted are purchased from the Government at 5¼ cents, cash; in this way the sales aggregate about 250 tons. Bar, and Pipe and Sheet are very steady at old rates.

COPPER.—The manufacturers of copper are very firm at the advance noticed in our last, and with a further considerable rise in the price of the raw material, the prospect seems imminent for a still higher adjustment of values on all manufactured goods. Cable advices quote a further advance of £5 per ton in London on Chili Pig and Selected English, and our market retains the feverish, unsettled feeling noted in our last. The business has again been large at an advance of ¼@½ cents per lb. The moderate stock is concentrated, and with no considerable addition to the supply possible from the Lake region before next May, and the present prices in England preventing importations thence, the market seems to be entirely under the control of the holding interest; sales have been made of 1,500,000 lbs. Lake, commencing at 26¼ cents, and closing at 26½@27, cash, and 27 up to 27½ for next month and later delivery

SPELTER.—The tenor of the foreign advices continues to strengthen the market, and prices favor sellers. Sales have been made of 25 tons Silesian at 7 cents; and 25 do. Stolberg, to arrive, 6¼ gold.

STEEL.—There is no change to note in store prices, which, however, are very firm for English.

TIN.—Since the considerable business in Pig noted in our last, the market has been quiet. The quotations per cable from abroad are unchanged, and holders remain firm, demanding 43 cents for Banca, 28½@39 for Straits, and 38 for English, all gold. The only sale has been 5 tons English, to arrive, at 38 cents. Plates continue in demand and full, for some descriptions rather higher prices are obtained; we revise our quotations. The sales are 2,000 boxes Charcoal Tin at $9.25 @9.37½ for I. C.; 1,000 do. to arrive, $9.37½; 750 do. I. C. Coke, 10 by 14, $8.37½; 2,500 do. Charcoal Terne, part for future delivery, $8.25@8.75, including 500 boxes S. T. P. at the latter price; 1,000 do. I. C. and Budds Coke Terne, for future delivery. $7; and 300 do. on the spot, $7@7.12½, all gold.

Messrs. WHITE & HASKELL, in their monthly circular of 1st inst., give the following in relation to Pig Tin:—The importations for November were 2,534 slabs Straits, equal to 101 tons, and 40 tons Eng. L. & F. From the East Indies about 19,550 slabs Straits, or 782 tons, are on the way, and due in all December, January and February. Stock in importers and speculators' hands—Billiton, 1,800 slabs; Straits, none; Eng. L. & F., 30 tons; Banca, none. Total in New York and Boston, 1,800 slabs, or 90 tons, against 6,000 slabs, or 261 tons November 30, 1870; 10,419 slabs, or 418 tons same time 1869; and 10,750 slabs, or 432 tons same time 1868.

ZINC.—Mosselmann Sheet has again advanced ¼ cent, the agents' price being now 9¼ cents, less ¼ per cent. gold; 100 casks sold, before the rise, at 9 cents, less 4 per cent. gold. Store lots bring 10½@11½ cents currency. Manganese, black oxide, 3½ cents. Manganese, pyrolusite, 5 cents.

The following figures which we have gleaned from advance sheets of the Annual Report of the Chief of the Bureau of Statistics on Commerce and Navigation for the fiscal year ending June 30, 1871, shows the value and duty paid on our importations for that period on each item enumerated:

		Value.	Duty.
Copper and manufactures of		$765,186	$231,703
Iron	"	31,852,034	13,766,121
Steel	"	11,401,084	4,892,562
Lead	"	3,837,363	1,870,650
Tin	"	12,528,612	2,846,699
Zinc	"	943,964	348,667

METALS.

NEW YORK, Dec. 16, 1871.

IRON.—Duty: Bars, 1 to 1½ cents ₩ lb; Railroad, 70 cents ₩ 100 lbs.; Boiler and Plate, 1½ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ₩ lb; Pig, $7 ₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2½; Scrap Cast, $6; Wrought, $8 per ton.

	Store Prices
Pig, Scotch No. 1, ₩ ton	33 50@38 00
Pig, American, No. 1	36 00@37 00
Pig, American, No. 2	34 00@35 00
Pig, American, Forge	33 00@34 00
Bar Refined, English and American	— —@86 00
Bar Swedes, assorted sizes (gold)	85 00@100 00
	Store Prices, Cash.
Bar, Swedes	107 50@120
Bar, Refined, ord'y sizes	90 00@ — —
Bar, Refined, 1¼ to 6 by ½ @ 5-16 inch	— —@ 95 00
Bar, Refined, 1 & 1¼ by ¼ & 5-16	— —@ 97 50
Bar, Refined, 2⅛ to 3 Round & Square	— —@ 97 50
Scroll	107 50@137 50
Ovals and half-round	107 50@125 00
Band	— —@102 50
Horse Shoe	105 00@115 00
Rods, ¼ to 3-16 inch	95 00@130 00
Hoop	112 50@160 00
Nail rod	6¼@ — —
Sheet, Russia, as to assortment (gold)	17½@ 18
Sheet, Single, D. and T. Common	—5½@— 6
Sheet, D. and T. Charcoal	—6 @— 6½
Sheet, Galv'd, Nos. 14 to 25 27½ to 30 ct. dis.	12@14c lb.
" " Nos. 27, 26, and 29 27½ to 30 ct. dis.	15@18c lb.
Rails, English (gold), ₩ ton	57 00 @59 00
Rails, American, at Works in Pa.	70 00 @71 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₩ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb, and 10 ₩ cent ad val. (Store prices.

English Cast (2d and 1st quality) ₩ lb	— 15 @— 18
English Spring (2d and 1st quality)	— 7 @— 10
English Blister (2d and 1st quality)	— 10 @— 17
English Machinery	— 11 @— 13
English German (2d and 1st quality)	— 10½@— 12
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— 15 @— 16
American, Spring, do.	— 9 @— 11
American Machinery, do.	— 9 @— 10
American German, do.	— 9 @— 11

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	— @— 34
Copper Bolts	— @— 36
Copper Braziers, 16oz. and over	— @— 36
Copper Nails	— @— 40
Copper, Old Sheathing, &c. mixed lots	20 @— 21
Copper, Old, for chemical purposes, 14@16 oz	— @— —
Copper, American Ingot	26¾@— 27
Yellow Metal, New Sheathing & Bronze	— @— 24
Yellow Metal Bolts	26 @— —
Yellow Metal Nails	— @— 24

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, Foreign (gold) p. 100 lb.	6 50 @ 7 00
Plates, Domestic p. lb.	— 7 @— 11

LEAD.—Duty: Pig, $2 ₩ 100 lbs.; old Lead, 1½ cents ₩ lb; Pipe and Sheet, 2¼ cents ₩ lb.

Galena, ₩ 100 lbs	$— — @— —
Spanish (gold)	5 82½@5 90
German, do.	5 82½@5 90
English do.	6 00 @6 25
Bar (net)	9 25 @ —
Pipe (net)	— — @10 25
Sheet	— — @10 25

Colwell, Shaw & Willard Tin-Lined Lead Pipe 15 cts. ₩ lb.

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 25. ad val.

	Gold ₩ lb.
Banca	— @43
Straits	38½@39
English	38 @—

PLATES.

Fair to Good Brands.	*Gold.*	*Currency.*
I. C. Charcoal, ₩ box	$9 00 @9 50	$10 25 @11 00
I.C. Coke	7 25 @8 75	9 25 @10 25
Coke Terne	7 00 @8 00	8 00 @ 9 25
Charcoal Terne	8 25 @8 50	9 50 @10 25

An Unfortunate Omission.

We regret that, by reason of the loss of a manuscript in transmission by mail, the interesting paper of Mr. EDMUND PECHIN, of the Dunbar Iron Works, Pa., on "the Recent Explosion of a Blast Furnace at Youngstown," which was read at the Troy meeting of the Institute of Mining Engineers, is delayed in publication. We hope to give it in an early number, and will send a copy of the number containing it free to any member or associate who will write to us requesting it. We mean that our report of the meeting shall be complete.

THE shops of the Delaware, Lackawana, and Western Railroad at Scranton, Pa., employ about five hundred men in the car department, and cars of almost every kind are being constructed, of which may be mentioned two passenger cars of very superior style and workmanship, fifty-three feet in length and ten feet wide, and seating sixty-two passengers. The shops turn out ten coal-cars and one flat-car per day, and also sixty-four car-wheels from the foundry. Mr. ROBERT MCKENNA is the superintendent of the car department.—*Ex.*

About Town Jottings.

On Wednesday forenoon, despite the unfavorable state of the weather, quite a number of gentlemen, representing the engineering department of the Navy Yard, the Board of Underwriters, and other marine interests, assembled in the ship yard of the Messrs. Poillon, in Brooklyn, to witness several tests of the "American Submerged Pump," as a ship, force, vilge, and head pump, which were eminently satisfactory. Two men pumped 41 gallons (raising the water twenty feet) in twenty-six seconds through 12 inch pipe, and the smallest man among the representatives of the press, pumped the same amount, with one hand, in fifty-five seconds. A small tank was filled with corn, oats, and sweepings from a coal bunker, and when water was added and the pump inserted, the whole mass was pumped out, giving a steady flow from the discharge pipe.

Aluminum Bronze.

This composite metal is daily entering more largely into industrial uses, and is fast becoming a great favorite with metal workers. The best proportions are fonnd to be 10 per cent. of aluminum, and 90 per cent. of copper. For color, it is not suapassed by, and closely resembles 18-carat gold, while it is capable of receiving a polish far superior in brlliiancy to any gilding. Aluminum bronze may be forged like iron or steel, either hot or cold, and become very compact under the hammer. It may be rolled into sheets, or drawn into wire, or tubes of any diameter. Its specific gravity is about that of iron. This composition is less affected by the atmosphere than any metal or alloy except gold, platinum and aluminum. It is tougher than iron, very stiff and elastic, and possesses a number of qualities of the greatest value. It is now principally used for watch movements, as well as spoons, forks, cups, and jewelry, but its use is rapidly extending into the more purely mechanical arts.

DURING the late conflagration in Chicago, two fire engines were sent from Bloomington, Illinois. In two hours and forty minutes from the time they started, in a special train, over the Chicago, Alton, and St. Louis Railroad, they were throwing water on the fire. The train had made the run, one hundred and twenty-six miles, in two hours and ten minutes, and the run from Bloomington to Joliet, eighty-nine miles, was made in eighty minutes.

DR. ISIDOR WALZ,

ANALYTICAL and CONSULTING CHEMIST

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Wilkesbarre and Lehigh Coal,

OFFICE:

Room No. 49, 111 BROADWAY, (Trinity Building).

JNO. WHITE,

jan1-1y LINDLEY H. FOWLER,

LOUIS T. SNOW.

DEPARTMENT OF POPULAR SCIENCE.

The Permanent Gases.

It is a generally received opinion that all gases are mere vapors of liquids that boil at very low temperatures. Thus, while water boils at 212°, common ether boils at 96°, and sulphurous acid at 0°. Consequently, while water is always a solid or a liquid, in all parts of the earth, ether would be a permanent gas in any place where the highest tropical temperature prevailed, and sulphurous acid is always a gas except in the cold of the polar regions. Even the dense and brilliant metal, mercury, when exposed to a temperature sufficiently high, becomes, in reality, a perfectly colorless and transparent gas, and carbonic acid gas, when exposed to a temperature sufficiently low, becomes first a yellowish, oily-looking liquid, and then a beautiful, snow-white solid. The only difference, then, between common snow and carbonic acid snow is that the one is much colder than the other, while, on the other hand, the only difference between carbonic acid gas and mercury gas is that the one requires a higher temperature for its existence than the other. There are certain gases, however, which no degree of cold yet reached has reduced to the liquid, far less to the solid form. Prominent amongst these are oxygen and hydrogen—the gases that, when combined form water. But after it had been observed that intense cold tended to reduce all gases and vapors to the liquid form, it was supposed that if hydrogen and oxygen could only be made cold enough, they would become liquid too. So they were cooled with freezing mixtures; and still they remained in the gaseous state. Then a still more powerful freezing agent (solid carbonic acid) was used. But, although mercury became solid, and alcohol, unless very pure, became thick and pasty instead of clear and limpid, still hydrogen remained unaltered. After a time, a still more powerful freezing mixture (liquified laughing-gas) was discovered. NATTERER, of Vienna, made a powerful steel pump, and pumped laughing-gas into a large iron receiver or bottle, until it became liquified with the pressure. When a little of this liquid was poured into the air, it evaporated, and produced the greatest degree of cold ever observed—a degree of cold 257° below the zero of FAHRENHEIT's thermometer. Of such a temperature we have but a very faint idea. * * * Even then, oxygen and hydrogen did not liquify, but maintained their condition as clear and beautiful gases.

But cold alone was not the only agent brought to bear on these gases for the purpose of reducing them to the liquid form. They were subjected to immense pressure, a pressure far exceeding anything with which we are familiar in ordinary life. It is well known that if water be subjected to great pressure, it will remain a liquid at temperatures far above the boiling point, although, if exposed to the air at that degree of heat, it will become a clear vapor which can not be distinguished from a true gas. Nitrogen, oxygen, and hydrogen are undoubtedly liquids at some very low though unknown temperature. Their boiling point is probably a great deal lower than 300° below zero; the boiling point of carbonic acid is 80° below zero; the boiling point of water is 212° above zero; and the boiling point of mercury is 600° above zero. And just as water may be heated far above 212°, and still remain a liquid, provided it be subjected to great pressure, so it was thought that oxygen and hydrogen gases might be subjected to what was for them, a very high temperature (257°), and yet remain liquid, provided the pressure should remain sufficient. So NATTERER constructed a series of very finely made steel pumps. With one of these, he condensed one of the gases into a strong vessel until it occupied but the three-hundreth part of its original bulk. Then, with a still more powerful pump, he condensed this already dense gas, so as to reduce it still further. It will readily be seen that, by employing gas in a condensed state, it was much easier to force it through the valves of the second pump than if gas at the ordinary pressure had been used. In this way, by working with gas gradually increasing in density, be finally obtained a pressure of 3,000 atmospheres.

Now, our readers know that the atmosphere presses on each square inch, with a force of 15 lbs., or rather less; consequently, 3,000 atmospheres would give us 45,000 lbs., or 22½ tons, per square inch. If we have no idea of a temperature of 257° below zero, neither can we fully grasp the enormous pressure expressed by the figures 45,000 lbs. per square inch. Most solid substances would be crushed to powder under such a pressure as this. And yet to this wonderful pressure did NATTERER subject oxygen and hydrogen. But even a cold of 257° and a pressure of 45,000 lbs. per square inch made no impression on them, at least so far as change of form is concerned.

But that which NATTERER, aided by all the resources of modern science, failed to do, chemical affinity does instantly and perfectly. Mix the gases in proper proportions and bring the smallest flame into contact with them, so as to produce ignition, and they will instantly rush together with a loud report, combine and form a perfect liquid, water. It is perfectly obvious that the elementary atoms of this new liquid, water, must be held together by a force sufficient to overcome their expansive force. We have seen what this expansive force is capable of resisting, and consequently we can form a comparative estimate of the power of chemical affinity.

* From "The Chemical History of the Six Days of Creation," by JOHN PHIN, C.E.

New Publications.

JOURNAL OF RESEARCH *into the Natural History and Geology of the Countries Visited during the Voyage of H. S. Beagle round the World, under the Command of Capt.* FITZ ROY, R. N. By CHARLES DARWIN, M. A., F. R. S. New Edition. New York, D. Appleton and Company, 1871, 519 pp.

The first English edition of this book was issued in 1839; the second in 1845; the third in 1860. It is our impression that an American house republished one of the earlier editions; and the present American issue is apparently printed from the plates of the former. On the whole, the work having become almost a classic, it would be a pity to have it re-edited by the author at this late day. It would inevitably take color from the more recent developments of views which at the time of its composition he cannot be said to have entertained. The freshness of youth and eager but not prejudiced inquiry prevades it; and these qualities are less apparent in Mr. DARWIN's last books. By the term prejudiced, however, we mean in direction rather than in conclusion. Most eminent scientific investigators arrive in their prime at some connected theory which they propound or adopt, and subsequently devote themselves to verifying. If Mr. DARWIN should now travel once more around the world, it is not too much to say that he would be looking everywhere for proofs or objections to his hypothesis of the Origin of Species. His inquiries would be polarized, and the answering reflections of the universe would be limited if not distorted, by this circumstance.

"The Origin of Species" is "hard reading," in spite of its clear style and marvellous wealth of illustration. It is burdened throughout with a purpose, to which everything is subordinated. The argument demands attention at every step, and the most indolent reader cannot escape the logic which forces, link by link, a chain of weighty conclusions. Of course, this is a great merit in that book; but the absence of it is a pleasant feature in the "Journal of Researches."

Here we have one of the most charming records of travel that can be conceived—a succession of pictures, the smallest details of which are illuminated with suggestive reflections. The remark of a London critic a quarter of a century ago is still the verdict of the reader: "The author is a first-rate landscape painter, and the dreariest solitudes, are made to teem with interest." The object of the expedition of which Mr. DARWIN was the naturalist was to complete the survey of Patagonia and Terra del Fuego (commenced by Captain KING in the Adventure in 1826 to 1830); to survey the shores of Chili, Peru and of some islands in the Pacific; and to carry a chain of chronological measurements round the world. The ship left England Dec. 27, 1831, and arrived again Oct 2, 1836, after an absence of nearly five years. Mr. DARWIN's Journal of this period, perhaps even more than the scientific memoirs which he published on special topics of investigation after his return, proves him an observer of extraordinary keenness and universality. Nothing in nature or man seems to escape his vigilance; and in the power of recognizing the significance of facts in every department of knowledge, he is scarcely surpassed by any writer except HUMBOLDT—who surpasses all. It is not uncommon to find men who know a great deal, but are gorged and rendered inactive by the amount of their cramming. Once in a while enormous learning is combined with equal activity of intellect and imagination, in some man greater than his own knowledge; vast acquisition produces, not indigestion and torpidity, but nutrition, blood, muscle, brain—in a word, gigantic power. Such a man is DARWIN, revealed most completely in his recent works, but most pleasantly in this Journal.

We cannot forbear to quote the excellent advice to young naturalists, the wisdom of which has been so well demonstrated by Mr. DARWIN's own career.

"In conclusion, it appears to me that nothing can be more improving to a young naturalist, than a journey in distant countries. It both sharpens, and partly allays that want and craving, which, as Sir J. HERSCHEL remarks, a man experiences a hough every corporal sense be fully satisfied. The excitement from the novelty of objects, and the chance of success, stimulates him to increased activity. Moreover, as a number of isolated facts soon become uninteresting, the habit of comparison leads to generalization. On the other hand, as the traveller stays but a short time in each place, his descriptions must generally consist of mere sketches, instead of detailed observations. Hence arises, as I have found to my cost, a constant tendency to fill up the wide gaps of knowledge by inaccurate and superficial hypotheses."

"But I have too deeply enjoyed the voyage, not to recommend any naturalist, although he must not expect to be so fortunate in his companions as I have been, to take all chances, and to start, on travels by land if possible, if otherwise, on a long voyage. He may feel assured, he will meet with no difficulties or dangers, excepting in rare cases, nearly so bad as he beforehand anticipates. In a moral point of view, the effect ought to be, to teach him good-humored patience, freedom from selfishness, the habit of acting for himself, and of making the best of every occurrence. In short, he ought to partake of the characteristic qualities of most sailors. Traveling ought also to teach him distrust; but at the same time he will discover how many truly kind-hearted people there are, with whom he never had, or ever again will have any further communication, who yet are ready to offer him the most disinterested assistance."

The most important thing, scientifically speaking, in this book, is the explanation of the forms of the coral islands, which Mr. DARWIN was the first to make known, and which our own DANA subsequently (on the WILKES Exploring Expedition) enlarged and illustrated. In DANA's Geology it is said, that "the origin of the atoll form of reefs was first explained by the geological traveller, CHARLES DARWIN." This title indeed seems far too narrow to describe the comprehensive abilities and activities of Mr. DARWIN; but it may serve to remind us that if he had not begun as a patient, zealous, conscientious, scientific traveller, he would probably never have acquired the power which now enables him, from the chamber of an invalid, to sway the minds of men, and shake the philosophies of the world.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
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Editors.

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The American Institute of Mining Engineers.

We continue our publication of papers read at the recent meeting of the Institute, giving this week among them, the report and suggestions of the worthy secretary. It is perhaps well to say that the views Mr. CORYELL advances are his own, and not endorsed, as yet, by any official action of the Council or the Institute. We say this frankly, because at several points we decidedly disagree with him.

In expressing a preference (in the present state of the Institute's treasury) for a "journal of the society," he stands, as far as we know, alone. Whenever the society can run a journal of its own, we shall be glad to have it do so; until that time, which has certainly not yet arrived, we offer it the columns of the ENGINEERING AND MINING JOURNAL, assuming ourselves all the trouble and expense of reporting and publishing its proceedings.

We respectfully differ with Mr. CORYELL, likewise, in regard to his desire for changing the name and the rules, first, because it cannot be done until the May meeting, and secondly, because we don't think it ought to be done then.

Finally, we think the formation of branch societies, "under the direction and guidance of the parent society," would be a very unwise step at present. The Institute, vigorous as it is, has not yet the age and strength to throw out branches; and when local societies of Engineers shall be founded, they had better be under nobody's protection and guidance but their own.

All of which, being merely our opinion, has no more authority than the Secretary's report, which contains merely his opinion. The Council and the Institute will decide such questions in due time, and meanwhile, it isn't worth while to worry much about matters of names and rules. If we continue to have pleasant and profitable meetings, we can exist and flourish till May under present conditions, and if we should fail in these great points, change of name and a plantation of branches, with a journal for each of them, would not save us from deserved decay.

Still another New Explosive.

Metallic sodium has for some years been known to possess a remarkable degree of explosive force. To Prof. HENRY WURTZ is, we believe, due the credit of making the suggestion, in the first instance, that this force might be employed for blasting, but we believe that at that time no action was taken upon the proposal, and now it has been revived and one of our chemical cotemporaries notices some of the objections to its use, but does not express any views regarding the feasibility of the project on a large scale.

The application of sodium for the purpose of blasting is made as follows: Two glass bulbs of 50 cubic centimeters capacity are blown with a neck of glass between them; one bulb is filled with sodium and the other with water, and between the two is fused a soluble salt. The length of time required to dissolve the salt can be ascertained by experiment, and the connecting tube be made so as not to have the charge fired prematurely. The bulbs, with the sodium below, are let down into the drill hole, the water gradually dissolves up the salt, and thus comes into contact with the metal, and the explosion follows.

The danger of using an explosive that is bound to go off within a certain time after its insertion in the drill-hole, will be at once apparent to all practical men, and this would be sufficient to prevent its use by careful blasters, even if it were not open to other objections, such as the scattering about of unoxidized sodium.

The Emma Mine Again.

In our comments upon the recent sale of the Emma mine in England, and the connection therewith of the American minister, we did not render complete justice to the brilliant history of the mine. The Secretary reports under date of October 14, 1871, that the following amount of ore has been extracted: 3000 to 4000 tons, first-class, estimated to have been shipped prior to July 12, 1870; 14,500 tons, first-class, extracted from July 12, 1870, to October 14, 1871; 8000 tons, second-class, on hand at the mine; making 25,500 to 26,500 tons of all grades. At $182 per ton (the value of the first-class ore shipped in 1870—which, we think, has not been exceeded by the average shipments of 1871), we have over $3,000,000 of gross product, exclusive of the second-class ore on hand, which is estimated at $75 per ton.

Professor SILLIMAN reports (according to the statements of the prospectors) 13,250 tons of first-class ore still in the mine, of the estimated net value of about $1,750,000. In addition to this, the assets include some $200,000 cash, $350,000 estimated net value of ore *in transitu* to England, and the estimated net value of 8000 tons of second-class ore at the mine, about $300,000. The plans, machinery, buildings, stores, etc, are included, but not appraised. These estimated assets seem very large; but we can afford to accept them without changing our opinion as to the price put upon the property. It still remains a serious question, whether a mine that has yielded three millions, and is estimated to contains underground and in the dumps, two and a half millions more, is worth five millions. Professor SILLIMAN's report, as quoted piece-meal in the prospectus, commits him to the opinion that "beyond all reasonable doubt," the Emma is a "true mineral vein of great power." If this means (as it certainly ought to mean) that the Emma is a regular fissure veins and may be expected to continue indefinitely in depth, we can only say that the evidence proving "beyond reasonable doubt" such a conclusion must be of very recent date. Professor SILLIMAN's examination is the latest that has been made, and his opinion has the weight of "the last word," though it contradicts the views of other experts, by whom from the beginning the Emma has been set down as an interstratified or lenticular deposit. It is upon this one point that the appraisal of the property at $2,500,000 more than the "value in sight" is based. We have no doubt that Professor SILLIMAN has had nothing to do with fixing this price; and the whole thing illustrates what we said in a recent article, that the opinions of experts are employed, and their reputations risked, in ways which they would not justify, but cannot always prevent.

Meanwhile, Mr. SCHENCK's position is not effected by any of these considerations. The prospectus announces that "on account of the exceptional character" of the undertaking, he has permitted the use of his name as a director. This part of the undertaking is certainly "exceptional," and ought to be made, like other exceptions, to "prove the rule," that American Embassadors must not sell their official influence for speculative purposes.

Scientific Investigation.

In no other field of mental activity is more careful logical training, a knowledge of more facts, closer observation of phenomena and greater freedom from prejudice necessary in order to arrive at the truth, than in furnishing rational solutions for problems which nature daily brings to our notice. The investigator must be a thorough master of the already demonstrated facts in the branch of science which he intends to illustrate; he must labor systematically, judiciously and with indomitable perseverance and energy; and he must adopt no supposition as a premise in his argument until its truth has been conclusively proven. These are merely some of the requisite conditions, and so evident is it that they must be complied with, before one can hope for any success in scientific investigation, that we would not enumerate them without apologizing to our readers for our apparently low estimate of their understanding, were it not that at least one candidate for honors has appeared in the field, who displays a deplorable lack of these very qualifications.

It is true that a man who has not gone very deeply into the study of physical phenomena may discover some important physical truth; but his chances are not very good; and he would be of more benefit to himself and to the community, if he would devote his energies to some occupation which did not demand so much knowledge, or else set modestly at work and acquire the knowledge in the first place.

We publish in another column an abstract of a paper, in which the author imagines that he has satisfactorily demonstrated a theory that boiler explosions are caused by electrical decomposition of the water in the boiler, and the re-union of the constituent gases by an electric shock. The paper is an exceedingly long one, and liberally interlarded with Latin quotations, poetic apostrophies to thunder storms, a complete classification of clouds, and various other bits of information, which it would require more than our allowance of imagination to connect in any way with the subject of boiler explosions.

The reasoning by which he disproves the notion that a pressure of steam is in all cases the cause of

boiler explosions, and that water heated above 212° under pressure will be partially converted into steam by the removal of the pressure may be summed up in few words, viz.: the former, by citing a case in which he thinks that steam pressure could not have been the cause; and the second by citing another explosion in which the boiler contained nothing but steam and rags. Would not the logical conclusion from his own argument be, that in the second instance, the boiler was burst by the rags? He says that if a boiler were to be forced apart in the middle by the pressuae of steam, both pieces would fly in the same direction, because, to use his own words, "the issue of steam through the breach diminishes the pressure upon the other extremity as on the rest of the boiler, the pressure being an impelling force acting against opposite points in all parts of the boiler, all these parts react by resistance, and whatever diminishes the impelling force at any point necessarily weakens it at every other; and the effect of the pressure breaking through at one end would never be to drive the other end in an opposite direction. The tendency would be *by lessening the impelling force* there, to give the reactionary or resisting power a movement in the same direction with the steam issuing through the breach." The author seems to imagine that "the lessening of the impelling force" is the same thing as reversing its direction, or else he must think that the "resisting power," which is either the inertia of the boiler or the strength of the fastenings by which it is held in position, and which is a statical power, is in some unaccountable way converted into a dynamical force.

We might multiply examples of such inaccuracies in the logic of the paper, but we would only weary our readers. We cannot, however, omit to notice the fallacy of the hypothesis on which the whole of the argument rests. It is that the water in the boiler is decomposed by electricity, which is generated in large quantities during the conversion of water into steam. The author refers with confidence to the steam electric-machine as proving that his notion is correct; not noticing the fact that in order to get any considerable electrical manifestations the boiler must be insulated, and the additional fact that the electricity produced is frictional and not galvanic. Frictional electricity possesses almost infinitesimal chemical or decomposing power. According to FARADAY, 800,000 charges of the Leyden battery which he used in his experiments would be necessary to decompose one grain of water; the same quantity of electricity would be sufficient to retain a platinum wire, 1-104th of an inch in diameter, red-hot, in contact with the air for three and three-quarter minutes. Again, if the boiler were not well insulated, the electricity generated would be carried off harmlessly to the earth.

We have not the slightest acquaintance with the author of the paper referred to, and are very far from wishing to offend him in any way. His paper is only taken as a sample of many which are read from time to time before our societies, the authors of which would save themselves much mortification, if before publishing their views on subjects with which they have but slight acquaintance, they would submit their papers to the criticism of some well-posted scientist.

Steam on Canals.

EXPERIMENTS have recently been made on the canal between the Little Basin at Albany and West Troy, with the Belgian system of driving canal boats by means of steam power, which is thus described:

An iron or steel wire rope, of from one-half inch to one inch diameter, according to circumstances, is laid down in the bottom of the canal or river from end to end, following the bends and curves of the water-course, resting uninterruptedly through or over locks, and being fastened only at the two extreme ends of the canal. In this case an English steel rope is used with an iron center. A steam-engine, portable or fixed, is placed on the vessel which has to be towed, or which may serve as a tug for towing other boats. This engine works one of Fowler's clip-drums, a pulley of peculiar construction, which requires here a more detailed description.

It consists of a cast-iron wheel (here 6 feet in diameter,) the circumference of which, forming the groove of a pulley, is provided with a number of movable clips, turning round steel centres. These clips, each pair about 2½ inches long in the direction of the circumference, nearly touch each other, and form thus a complete movable groove, in which a rope may be placed. The centers of the clips are so arranged that the rope, pressed into the groove by its own strain, produces a slight movement of the clips toward the center of the drum, narrowing thus the space in which the rope rests. This will produce a certain pressure of the clips against the rope, which increases with the force with which the rope is pressed into the clips, and which again is in proportion to the strain exerted by the rope. It is, therefore, clear that, with a very small strain in what is called the back or slack rope, a very considerable strain in the pulling or front rope can be exerted without any danger of slipping, as the friction between rope and pulley increases in proportion to the power exerted. The necessary tension in the back rope, where it is not produced by the natural disposition of the machinery (as, for instance, in lifting apparatuses for mines, etc.,) is gained by a press-pulley, which, rolling on the rope at the point where it leaves the drum, produces sufficient friction between the last clips touched by the rope and cable itself to replace the required back strain and secure the action of the clips. The experience of many years has proved that drums of four to five feet diameter, acting on a rope which touches half the circumference of the groove, are capable of transmitting with perfect safety 40 to 50-horse power, the rope moving at the rate of four feet per second, or in other words exerting a direct pull of over 6,000 pounds.

Into the groove of this drum, which is attached to and worked by the machinery on board the vessel, the towing-cable is placed. The engine being put in motion, the boat is naturally hauled along the towing-cable, which by the action of the machinery is in a slanting direction lifted up from the bottom of the canal, and after passing over the slip-drum falls back again, slack and nearly perpendicularly into the water. The weight of the rope, which produces the necessary friction and adhesion to the bottom of the canal, is, if one may say so, the fixed point at which the clip-drum pulls. The strain produced by it will be felt some distance ahead of the boat, stretching out that part of the rope. But after having passed the clip-drum the wire will fall back into the bottom of the canal with the slackness it had before, This slackness of the rope behind, combined with the fact that ahead of the boat the cable is lifted from the bottom of the canal to a considerable distance, given by the strain, by its weight per foot and by the depth of the canal, allows an almost perfectly free movement of the boat with regard to steering.

There are four causes for loss of power inherent to the system. Without going into detailed calculations we have as loss: (1.) The unavoidable friction of the gear, communicating the movement of the engine to the clip-drum, which usually is a single short intermediate shaft with bevel wheel and pinion, the first moved by the crank shafts, the second moving the clip-drum. (2.) The power required to bend the rope around the drum and guide pulley. This, if the pulleys are large enough, is of very small importance. 3. The loss produced by the standing direction, in which the wire rope is lifted from the canal-bottom, while the direction of the useful draft is horizontal. The engine exerts its full power in the slanting direction of the rope, producing thereby a somewhat smaller horizontal strain, which actually propels the boat, and a small vertical one which depresses it. Practically, the angle of the rope in towing two 200-ton boats against a current of one and a half miles, with a speed of two and a half miles in a canal of seven feet depth, proved to be 1.13. This produced a loss of less than one per cent. of the power applied. Lighter boats, greater depths of water, and heavier cables would of course make the circumstances less favorable. (4.) The vertical strain produced by the standing rope will sink the boat somewhat deeper into the water, and thus increase the power required to move it, causing a further trifling loss.

The lifting up of the rope itself from the bottom of the canal produces no direct loss of power, as the cable falls back again to the same level, and the lifting and sinking back naturally balance each other. In spite of these trifling losses, therefore, nearly the whole power of the engine is employed for direct propulsion. This allows the employment of engines of the smallest description, of scarcely any weight, which would diminish the capacity of the vessel, and taking no space whatever out of the hold of the boat. It gives especially also the possibility of using portable engines placed on and removed from the boat whenever required.

The part of the canal along which the wire-rope is now laid is six miles long, and embraces a lock, with a lift of nearly seven feet, and several curves. It is 72 feet wide at the surface of the water, 46 at the bottom, and 7 feet deep.

The tug, Gov. Clinton, which has been fitted up with the machinery described, towed a scow heavily laden with stone at the rate of three miles per hour with ease, and returned bringing several loaded boats at the same speed.

This is about double the usual speed attained when horses or mules are used, and it is claimed that it can be maintained for any length of time, with the consumption of only one ton of anthracite coal in twenty-four hours, when transporting from 400 to 500 tons of freight.

Figures are given to show the extreme economy of the system in other countries. They appear to be sufficiently authentic and reliable to warrant the thorough testing of the system by the State or by large canal companies. The wear and tear of the steel wire-rope must be considerable, an item of expense which is not included in estimating the cost of this means of propulsion.

MINING SUMMARY.

California.

CALAVERAS COUNTY.

The *Chronicle* of November 25th has the following on the Wolf mine:

The work of prospecting the lead has proved the existence of three auriferous "chimneys," known as the north, middle and south chimneys. The latter has been "stoped" out to the depth of 126 feet, the quartz extracted—good, bad and indifferent—averaging something over $25 per ton. The new engine shaft passed through a part of the middle chimney 221 feet from the surface, At that point some excellent quartz was taking out containing gold in visible quantities, associated with galena and iron sulphurets. The north chimney was intersected by the shaft at a depth of 182 feet. To the depth now reached, 220 feet, the quartz composing the chimney has rapidly improved in productiveness. The fissure, at present, is two and a half feet wide between walls, and is gradually widening as the shaft increases in depth. The rich stratum recently struck is now about six inches wide, and consists of a beautiful dark blue quartz, rich in gold, and the sulphurets of iron and galena. A level is to be run under the chimneys as soon as the shaft is down 220 feet which will give "backs" for "stoping" as follows: North chimney, 130 feet; middle, 105 feet; south, 104 feet. Competent judges estimate that the best ore taken from the rich stratum recently discovered will pay as high as $150 per ton, while none of it will fall under $20.

EL DORADO COUNTY.

The Placerville *Republican* of the 23d says: All the mines in this vicinity are looking up; with a good supply of water and a little more energy, played out El Dorado will take the palm for the richest gold bearing county in the State or on the coast. The new quartz mill being erected at El Dorado for DAVIDSON & THEISS, under the

superintendence of Captain WOODWORTH, is nearly completed. It is generally believed that DAVIDSON & THEISS have one of the best quartz lodes in the State. Should this prove true after thorough trial, it will be a big thing for El Dorado.

INYO COUNTY.

The *Independent* of November 18th says: A. WINGARD, Superintendent of the Silver Sprout mines, has shown us a quantity of ore which is pronounced by competent, experienced judges to be the finest ever produced in the county, which is saying a great deal. It appears to be a singular combination of some of the richest characters of silver ore—chloride and black sulphurets, while particles of the white native silver are seen, with now and then good "colors" of gold. The shaft is now fifty-six feet in depth, the ledge seven and the ore five feet in thickness. Its average value will hardly be less than $1000 per ton, and probably more. The walls are nearly perpendicular, smooth and perfect, and the two-foot "gouge" is being rapidly crowded out by the "pay," which grows richer from top to bottom.

NEVADA COUNTY.

The Manhattan Company, says the Nevada *Gazette* of November 20th, commenced hauling rock to-day, preparatory to a crushing. This company are having their rock crushed at BEN MCCAULEY'S mill in Grass Valley, some five miles from the mine. To haul poor rock so far would not pay; but judging from appearances, the Manhattan boys are not only going to receive pay for hauling and procuring the rock, but will have a handsome dividend besides.

The Union Hill Gravel Mining Company, at Columbia Hill, is making extensive preparations for hydraulic mining. Heretofore they have used about 100 inches of water day and night. As night work is not as profitable as day work, the company concluded to construct a large reservoir and use 1000 inches ten hours daily. The reservoir will be completed in about three weeks, at a cost of between $3000 and $4000. Sixty men are now employed in its construction. The company has run a bed rock tunnel 1050 feet, and has 600 feet yet to finish. The rock is hard sienite, and only twelve inches advance can be made in twenty-four hours, with three shifts. To expedite the completion of the tunnel, the company is making arrangements to put in a diamond drill. This will be driven by water power introduced into the tunnel by means of an iron pipe. The pressure will be something over 300 feet. The power is to be applied to the drill by means of two hurdy-gurdy wheels. The tunnel has cost thus far $13 per foot. It is estimated that the diamond drill will facilitate progress in the tunnel sixty-six per cent. over the hand drill. This w inter the company will use in their claims two nozzles, one five-inch and one six-inch. The smallest will discharge 400 inches, and the largest 600 inches of water, under a 300-foot pressure. When their bed rock tunnel is finished it will be 297 feet from the surface, or from the first bench that has been washed off. This bench is 142 feet from the original surface. This will give the reader an idea of the original depth of the claims. The Union Gravel Mining Company have a vast amount of mining ground in one body their claims extending two and one-fourth miles on the gravel channel, which latter has a width of from one to two thousand feet. They use for hydraulic purposes in their claims 1,200 feet of 18-inch pipe and 3,800 feet of smaller pipe for their diamond drill.

Colorado.

BOULDER CO.

From the Central City *Register* of Dec. 6.

CARIBOU, Col., Nov. 29, 1871.

The whole timbered country to the north towards Ward, and west to the range, is covered with snow to the depth of four feet, but not so much snow towards the valley. The road is open from here to Middle Boulder, over which the teams are constantly hauling ore from the Caribou mine to that place. Preparations are being made to erect a new and substantial shaft house over the east end of the Caribou mine, and to repair the buildings throughout, so as to make it comfortable for all employes in the coldest winter weather. The houses are all arranged for warmth as well as convenience.

What the Swansea furnace will amount to is undetermined. We observed in the crushing-room of the mill, lots of pulverized ore from the Potosi, Blue Bird, Lone Star, Boulder County, and other lodes. The fire-grate burnt out, and now quietness prevails about the premises of the genuine Swansea furnace. But it is hoped that work will be resumed as soon as the necessary repairs can be made. Your readers will be kept posted in regard to the same. Owners of mines and ores are very anxious for the success of the works. Marketable ores are abundant, and there can be no prosperity until there are facilities for converting the same into cash. Much is expected of the Dayton mill, which is now nearly ready to go into operation.

Messrs. SANDERS & GATES have left for a short time, intending to return in the Spring, to resume work on the Boulder County upon a more extensive scale than heretofore. The stamp-milling test made just before the storm, at Middle Boulder, from Trojan ore, was very satisfactory; equal to the highest expectations.

LAKE CO.

From the *Register* of Dec. 6.

ORO CITY, Nov. 21:—The placer mines are nearly all closed up for the season. G. L. HENDERSON & Co. are still at work on the South side of California gulch. THOMAS STARR does not stop mining on account of cold weather, but works winter and summer. A warm spring a few hundred feet above him in the gulch, prevents the ground from freezing to any great extent during the winter months. I observed one man blasting up the cement in the gulch, and piling it up so as to freeze it. In many of the claims in this gulch, the cement contains a large amount of gold, and needs some kind of mill to crush it. If several of the claim-holders would combine and buy a cement mill, it would be a good investment. It is very doubtful if freezing it will free much of the gold; it may in time, but a cement mill would get nearly all the gold, and avoid a long delay of waiting on the freezing and thawing process.

The lodes are being worked lively. The Pilot Company have their new tunnel run to pay. On the Printer Boy, PAUL & CO. are busy taking out rich ore. Captain BREECE & Co., on the North end or New Brunswick lode, are in better pay than ever. Their second-class, or puddling dirt, will pay twenty ounces per cord. They retorted last week, two hundred and fifty ounces, and had plenty more in sight. I think it is the richest lode yet discovered in Colorado. There appears to be no limit to its production. They had one cord of their dump or waste dirt run in a stamp mill here, which yielded over two and a half ounces. I presume that PAUL & CO.'s dump is as good, as also that of the Pilot. We need reduction works badly.

At Granite, the Hatty-Jane Company have let a contract for the sinking of the main shaft fifty feet deeper, it being now but twenty. Nothing is being done on the Yankee Blade lode. The late disastrous fire in Chicago, prevents operations from being resumed again this winter.

CALIFORNIA GULCH.

From the Caribou *Post* of Dec. 2.

The first discoveries of gold in this section were made on Trout creek, a tributary of the Arkansas. The discoverers and pioneers of this section, Messrs. RAFFERTY, LEE, SLATER, ALV RD and KENNEDY. not finding it in "mass and position," started for the valley of the South Arkansas, evidently with a determination to follow that stream to its source before giving up the search. They were rewarded early in the spring of 1860 by finding very good diggings, in what is now known as California gulch. It is said that Fortune favors the brave, and this party were amply rewarded for their trouble and hardships, in striking the "streak," the first hole they sunk, the dirt prospecting a dollar to the pan. As soon as the discovery of gold was noised about, a perfect stampede followed, bringing in a host of miners, all eager to dig for the golden nuggets lying in the bottom of the gulch. Before winter set in, there were at least eight thousand people engaged in placer mining in this district. At the close of the mining season, a train of sixty wagons arrived loaded with bacon, nothing but bacon, one article of their Winter's supply of provisons.

It has been estimated that since the discovery of gold in Colorado, California Gulch Mining District has produced over two and a half millions in dust, and there are innumerable placers that with a small amount of capital could be made to pay a handsome profit on the investment. There are at present below Granite on the Arkansas, forty or fifty men employed in "rocking" dirt, that are making from $2.50 to $8 per day, the low stage of water being very favorable for mining on this stream in the Winter months.

This mining district at the present time is more noted for lode mining than placer. The Printer Boy, Pilot, Five-Twenty, American Flag, and Berry Tunnel, are the main objects of attention.

The Printer Boy was discovered in June 1868, by Messrs. SMITH & MULLEN. For a year at least, but very little attention was paid to it by the discoverers and owners. But during their absence, other parties jumped it and took out several thousand dollars. This drew the attention of the owners and a suit of ejectment was commenced. Litigation in this, as in hundreds of other cases, brought the lode more into notice. Since Messrs. PAUL, SMITH, & Co., proved the property as theirs, a main shaft has been sunk 190 feet, and a boundary shaft 78 feet deep. Between the two shafts a level has been run 450 feet over which is a stope of ground 60 feet in depth. A greater part of this was worked out the present summer. One hundred and forty-five cords of ore from this stope, treated at the Five-Twenty mill, gave an average yield of eighteen ounces per cord. At the time of my visit, the mill (one battery) was running on wall-rock that yielded from three to six ounces per cord. At the mine it was estimated that there were at least 250 cords of waste or wall-rock in the dump pile. This Winter, MR. COOPER SMITH, the mining foreman, intends sinking the main shaft 100 feet deeper, making it 240 feet in depth, and then drifting north 450 feet to the boundary shaft, making a stope of ground 100 feet in depth, and 450 feet in length. Two whim houses have been built during the past season. The excellence and durability of the work on the surface, combined with safety and neatness, with which the mine is timbered and the manner in which the mine is being opened, is very flattering to the skill of the foreman, Mr. Cooper Smith, who has had but three or four years experience in lode mining

Adjoining this, on the North, Messrs. BREECE, & Co. are working their mine. The main shaft 130 feet in depth, carries a crevice of pay ore six or eight inches in width. In the drift running south, eighteen feet from the shaft, is a crevice of pay ore from six to ten inches in width. In the breast of the drift running north, at the time of my visit, there was an inch of solid gold. In this mine the gold is found in pockets that yield from five up to one thousand ounces, as in the case of this one.

East of the Printer Boy, MR. JOHN HOOVER discovered a lode this Summer, which he christened the American Flag. The first ore treated gave a yield of eight ounces per cord. In the bottom 58 feet from the surface, the crevice has split. On the foot-wall the pay is four or five inches in width, and about the same on hanging-wall, with a horse of ground in the interval four feet in width.

The Five-Twenty, Printer Boy, and American Flag, and Berry Tunnel lodes, are in a feldspathic granite, as also is the western wall of the Pilot. Overlying the granite about fifty feet from this wall, is a stratum of limestone, where is found the finest specimens of forest rock in the world. On, to the range (the Mosquito), this limestone overlies the whole country, with here and there ledges of schist and granite cropping out.

Probably next to the Printer Boy in richness, is the Berry Tunnel lode, owned by Captain S. D. BREECE. A tunnel 100 feet in length has been driven on the vein, the breast of which is 40 feet from surface. Work has been suspended for several years, no attempt having been made until within the past year, to introduce a process for reducing the sulphuret ores of this locality. Careful assays shows that this ore contains a large percentage of gold, silver, and copper. The tunnel being badly caved in, it was impossible to examine this lode as I would like to have done. Within a hundred yards of this lode to the westward, the limestone makes it appearance, leaving the Five-Twenty, Printer Boy, American Flag, and Pilot, in a belt by themselves, on Gold Hill—very aptly named.

As to the process Dr. RAE attempted to introduce during the past season, I have but very little to say with regard to its merits or demerits; suffice, that if possessing the former, it was very poor policy on the part of the inventor, when requesting samples of ore for assay from the different owners of the mines, to demand of them what the ore assayed, before he would give returns, as he did with the Pierce boys.

The *Miner* of Nov. 30 has the following

BULLION REPORTS AND MINING ITEMS.

We committed an unintentional error a short time since in quoting the price of Silverplume stock at 2½ to 3 per cent. above par. We should have said that the stock was quoted at 150 to 200 per cent. above par. The stock of this company we learn from a late English paper has a strong upward tendency, having advanced in a very short time 25 per cent. above the former quotations.

The Stewart Silver Reducing Co. have shipped since our last issue,

Brick No.	Oz. Silver	Fine.	Coin Val.
384	1066	720	$ 992.34
385	1121	764	1107.32
386	834	740	797.97

387	888	748	858.78
388	1164	704	1059.47
389	1034	708	946.52
Also Lead Bars.			
83	1139	140	206.16
84	1096	128	181.39
85	951	212	260.67
86	1068	200	276 18
			$6686.80

We learn from Col. GEORGE E. H. GRAY that he has crushed, sampled and sacked, at the mill of the Trenton Gold and Silver Mining Company, Silverplume, during the month of November, 40 tons of ore, the greater portion of which was worth 668 ounces per ton. He informs us that the Silverplume mine is looking remarkably well, and that selected samples of ore taken from this mine yielded, in London, England, 3054 ounces per ton.

Arizona.

We copy the following from the *Citizen* of Nov. 18.

PINAL MINES.

Under date of November 9, at Florence, Captain T. B. KERR, writes to Governor SAFFORD, from whose letter we are permitted to copy the following:

We have in a short prospecting tour of less than three weeks, located some eighteen or twenty splendid looking silver lodes, and formed three mining Districts—all favorably situated in regard to wood and water.

Our first success was the discovery of the Holsted District, some fifteen miles up the Gila road from Florence. None of the locations here are over four miles from the river, with a good natural road running half way from the river to the mines. Our first location here was the Kerr Lode—an immense ledge which crops out boldly in some places forty feet from the surface and can be traced for miles on each side of our location through a limestone and slate formation. This lead I have no hesitation in pronouncing a true fissure vein, and shows metal in large quantities in places along the ledge. The ore, as far as I could judge without having the means of properly testing it, is a chloride and grey sulphuret rock, with a small percentage of copper and antimony, and perhaps a little arsenic; none of the last mentioned base metals, however, are in sufficient quantities to militate against the melting of the ore. The other ledges taken up in this District are pretty much of the same character of the Kerr, varying some in size and richness, but all good prospects.

From Holsted District we went to the picket post, when fortune again favored us and we were lucky in finding a ledge that I think will give all the boys interested a stake for life, if they are careful and do not throw it away. This is the Silver Queen Ledge; samples of the rock you have no doubt seen, as some of it has been tested in Tucson, and we have heard went over $6,000; another piece of the same rock, assayed in Salt River, went between $7,000 and $8,000, as I have been informed by Mr. MERCER. who has just come from there to join the Pinal prospectors. Whether these assays are correct or not, I am unable to say, but am inclined to believe them much too high; although it would not surprise me any if we were to find tons of rock right on the surface that will go into the thousands.

The formation here is exactly that of White Pine, Nevada, *i. e.*, black spar and porous limestone, while the ledge itself resembles very much the far-famed Eberhardt ledge; both ledges are situated in a saddle formed by two mountains, and the cases are just the same in both. I would feign make my comparison still clearer and say they are of equal richness, but I suppose I must wait, as the Eberhardt Company had to do, and prove its richness by sinking on it. We have made some five other locations in this District, all showing fair prospects, but none so rich as the Silver Queen.

Our third and last discovery, the Nevada District, embraces within its bounds a tract along Mineral creek, where I have no doubt we will find placer diggings, as the country looks most favorable. There are some fifty inches of water in the creek, amply sufficient for a dozen mill sites. In this District our rock is all smelting rock; as far as we have yet discovered it is argentiferous galena and grey and yellow carbonate ore, the same character as the Emma rock, Little Cottonwood, Utah Territory. Some pieces that we made a rough assay of, I estimated worth over $600. This ended our prospecting for one trip.

Idaho.

We clip the following from the Owyhee *Avalanche* of Nov. 18:

The mines of Idaho Territory, and more especially the Original, Galena, Golconda, Hope, Yellow Jacket, Independent, &c., rich silver and lead veins recently discovered in South Mountain Mining District, Owyhee county are attracting a degree of interest, among the capitalists who visit this city, rarely manifested toward new mining localities.

The examination of these mines made during a visit to them a short time ago, and the subsequent report of the "Original" and "Galena" lodes made to Messrs. HOLCOMB & Co., mining agents of this place, whose interests I represented on the occasion of my visit, has, from a description of the wonderful size of the "Original," and the splendid average assay value of the ores from each of the three mines, done much in bringing the District favorably before the public and many of our mining observers and speculators.

Mr. S. M. WESSELS, the discoverer of the District and of the "Original" and "Galena" mines, is in this city and is fairly representing the merits of his discoveries, together with the real worth and importance of the new Silverado. Mr. W. has sent to the English market for sale some of the mining property that himself and friends are the fortunate owners of, with every reasonable prospect of realizing at an early day something handsome from the transaction. The party having charge of the negotiations of sale is a gentleman of undoubted ability in his profession and of much influence with his people in the "Old Country."

While at South Mountain I made also a critical examination of the "Golconda" and "Hope" mines, and am satisfied that the "Golconda" will compare favorably with the "Original" in extent and worth, and that the "Hope" is the counterpart of the "Galena." The other mines of promise have been discovered since I left the district. I also visited the leading mines of the War Eagle Mountain and vicinity, and am confident that when the present system of stock speculations shall give way to more legitimate mining, your district will again become famous as a mining locality and Silver City regain its former *prestige* as one of our principal centers of mining attraction.

Nevada.

LITTLE DEER CREEK.

According to the Nevada *Transcript* the Murchie Bros. have struck a very rich mine on Little Deer Creek, about a mile from this city. Some years ago they worked the same ledge to the water level and took out some very rich rock, when they were compelled to stop for want of machinery. This fall they put up hoisting works and again commenced work. They succeeded in striking a ledge from two to three feet in thickness, upon which they have been working for several months, and they have been making a big thing. They have kept four stamps of the mill on Big Deer Creek in operation and have a big pile of rock ahead. The rock already crushed has paid from $35 to $40 per ton and the ledge now looks better than ever. A man who saw it, says the rock they are now taking out is literally filled with gold. Another man says they got out a quartz boulder a few days ago, which on being broken showed free gold all through. We congratulate the Murchie brothers upon their success.—They have been working hard for many years at prospecting, and their friends will be glad to learn they have struck it rich. The ledge is well defined and gives every evidence that it will hold out.

The Gold Hill *News* of Dec. 2, has the following mining items:

Last week the HALE & NORCROSS mine yielded 1,000 tons of ore. The Savage yielded 740 tons, the average assay value of which was $37 60 per ton. The Chollar-Potosi mine yielded 934 tons, the assayed value of which was $41,000. This mine shows improvement of late in its ore producing sections. A special meeting for the increase of the capital stock of the Daney Mining Company will be held on the 28th December. The present capital stock is $480,000 in 8,000 shares. It is proposed to increase it to $2,400,000 shares, divided into 24,000 shares.

Utah

We copy from the Caribou (Colorado) *Post* of December 1st, the following correspondence relating to the famous Ogden Tin mines:

CENTRAL CITY, Nov. 25, 1871.

MESSRS. ROGERS, YOUNG & Co.;

Gentlemen: Agreeably to your request, I have inspected the reported tin mines at Ogden, Utah Territory, and beg to hand you the following as my report thereon: On arriving at Ogden, I found the mines situated about seven miles north of the city, in the range of mountains, and about 2,000 feet above the level of Salt Lake Valley. I went to the mines, found a great number of men at work in places on a ledge or vein of chloritic, schist and syenite crossing the mountains of quartzite and mica slate, and having large quantities of what they called tin rock piled up on the surface, which had been pronounced by the assayers at Ogden to be very rich for tin, some of the rock producing as high as 33 per cent., which they say is in a metallic state, and not an oxide of tin, as tin is always found in. I at once said the whole thing was a complete swindle by the assayers on the men and the public, as not one particle of tin or any other metal could be found in the rock whatever, and which I had to prove to the men before they would believe they had been so grossly deceived. Samples of the rock taken from the different claims I have placed in the hands of your assayers in this place, and who, I am fully satisfied, will corroborate my statements that there is not one particle of tin or any other metal to be produced as represented, and if any metal of any kind has been taken out of the rock, as they state they have done, I am confident it has been put in the assay to mislead the poor laborer and the public, which I am informed has been the case to a great extent, as large sums of money have been paid for some of this worthless property, and in order to prevent any further swindling, I hope you will make these statements known through the public press for the welfare of the public, and the promotion of honest and legitimate mining. By so doing you will confer a great benefit to the public generally.

I am, gentlemen, yours most obediently,

H. B. GROSE.

CENTRAL CITY, Nov. 27, 1871.

H. B. GROSE, Esq.:

Dear Sir: Having tested the rock submitted for assay for tin ore, I fail to find a trace of that metal present.

Respectfully, etc.,

E. E. BURLINGAME,
Territorial Assayer, Col Ter.

CENTRAL CITY, Nov. 27, 1871.

MESSRS. RANDOLPH, YOUNG, ROGERS, and others:

Gentlemen: I have tested the samples of so-called tin ore, which Capt. H. B. GROSE brought at your request from Ogden, and have not been able to detect even a trace of tin in the different samples deposited in my office. I hope you will be the means of denouncing publicly this great tin swindle, by which too credulous persons have been deceived and robbed of thousands of dollars by means of dishonest men calling themselves assayers. Any one acquainted with the different tin ores will, by merely glancing at the Ogden specimens, pronounce them to be void of tin or any other metal. I freely corroborate the sentiments made in Capt. GROSE's report. Yours truly, A. VON SCHULZ.

We clip the following American Fork Mining items from a correspondence in the Salt Lake *Daily Review* of Nov. 15.

THE PITTSBURG MINE.

This mine shows a true vain at the terminus of the sixty-five feet from the surface. An average assay of the ore returned $60 per ton in silver and 69 per cent. in lead. A cut of twelve feet and an incline shaft of 43 feet shows an immense body of ore, which can with safety be computed at 5,000 tons. When the tunnel now being run is completed the ore can be put on the dump at the small cost of one dollar per ton. This ore, being a free carbonate, will only require shoveling up and sacking. The vein now shows fifteen feet wide with no hanging wall, the roof being all ore. Some skeptic, and others that put down American Fork as a humbug, may call these figures exaggerations, but I will put up my last five-cent piece that they are inside the margin, and will make the trip, snow and all, to prove it if any disbeliever will accompany me. This company has secured a fine furnace site, and will erect furnaces as soon in the spring as the weather will permit.

From this mine I went over the divide to the Waterloo lode, which is intended to be worked this coming winter. This mine is one of the oldest locations, and has a shaft down about 40 feet, showing a splendid vein of ore, assaying $552.12. If worked the coming winter it will doubtless raise another star in the fair banner of American Fork. I have found a good deal of work being still carried on in spite of the snow in this basin, besides the great battle about the Miller mine, from which they are taking out large quantities of ore. The French mine, the Mary Ellen lodes and others, are doing good work and bringing to the surface of their respective workings a goodly show of the precious metals. On the Grand Mountain, above the Waterloo lode, about half a mile

southwest, the famous Silver Glance lode is being pushed ahead night and day. I am told by Mr. HASWELL, the Superintendent, the company will continue work on the mine until the 1st of January at least, and probably all winter, and that a mill will be erected in early spring. On the same range half a mile south, the Champion lode is being worked with great energy, three shifts of good miners being constantly employed. This mine gives great promise, and as the company has made liberal preparations to continue work through the winter, no doubt can be felt that they will reap the rich harvest they deserve. Dr. E. W. Nold, the Superintendent, is a gentleman of indomitable perseverance.

Following the ridge down still south a short distance, we find the Walker lode, lying idle, being under the incubus of bonds.

Below and east of this, about 2000 feet, is the Major Evans lode. This lode shows a considerable amount of good work, having two shafts 40 feet each, and a tunnel 175 feet, showing strata of galena and ochre, all evidently leading to a good lode, from all indications. Practical men who have visited the mine say it is a certainty that the main body of ore is within a few feet of the present working. Eight men are steadily at work, and every preparation is made to work through the winter.

P. S.—I forgot to mention a very valuable discovery of fire clay in American Fork, near the principal mines. Mr. Jones, the builder of the Sultana and other furnaces in this Territory, and a gentleman of great experience, is my informant. He says the best description of fire brick can be made from this clay, in fact better than any he has seen in this country.

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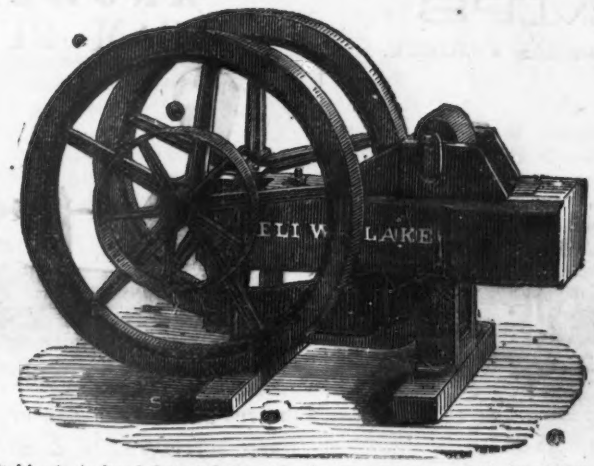

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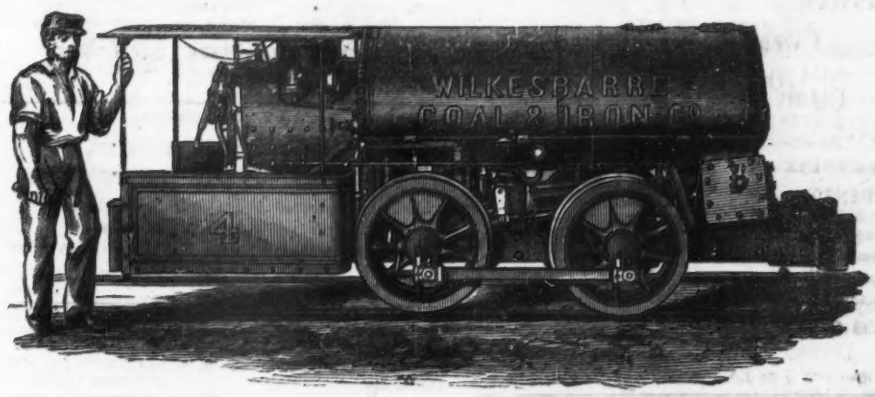

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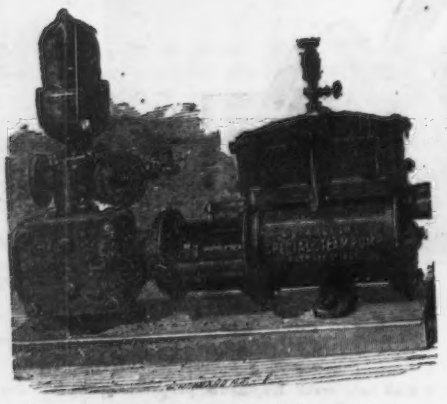

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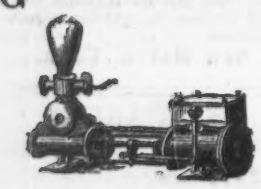

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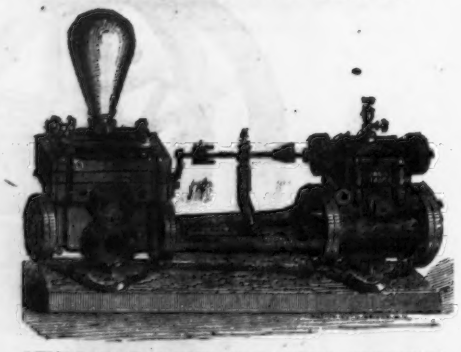

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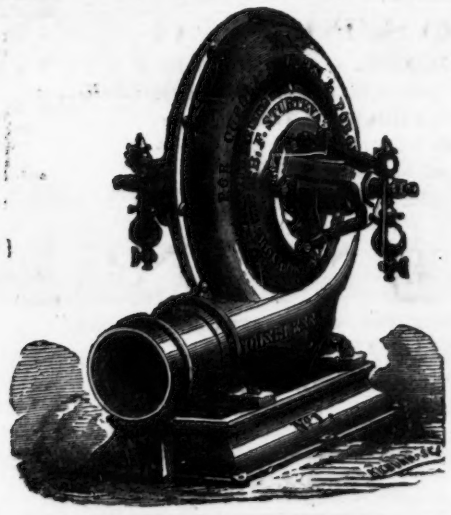

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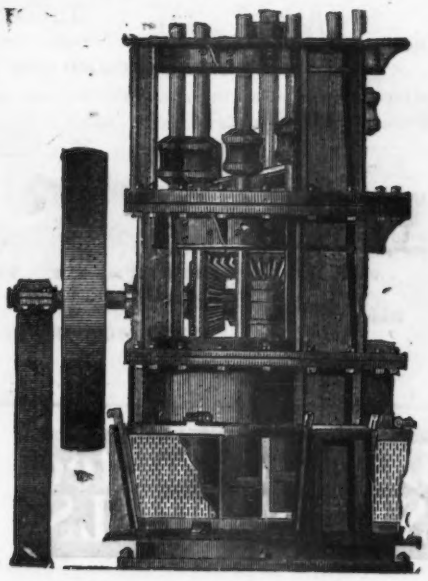

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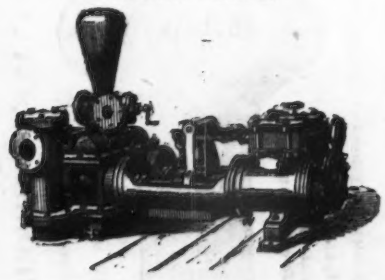

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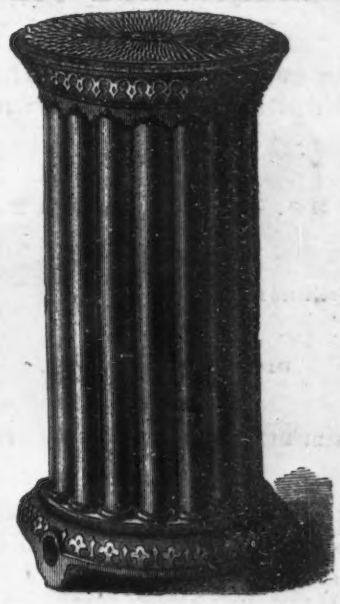

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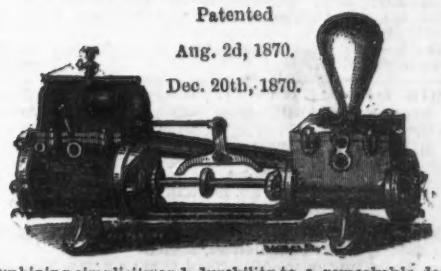

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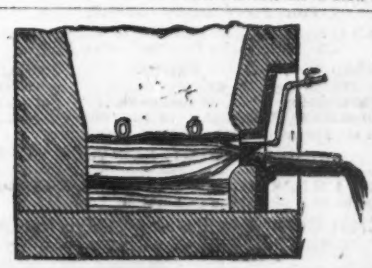

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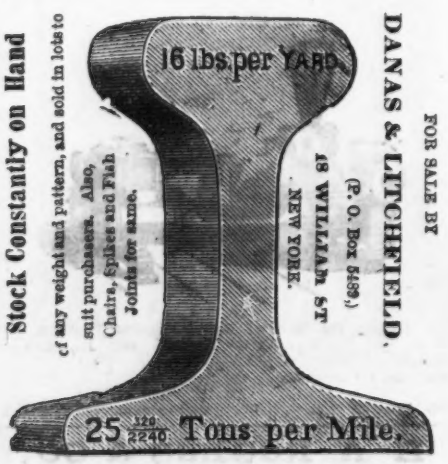
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